Report on High Performance Building's Energy Modeling

Physical Building Information Modeling for Solar Building Design and Simulation

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August 2012



ENERGY SYSTEMS LABORATORY

Texas Engineering Experiment Station The Texas A&M University System

NSF Grant CBET-0967446

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- **Submitted to:** Environmental Sustainability Program, Division of Chemical, Bioengineering, Environmental and Transport Systems (CBET), National Science Foundation
- **Report Date:** 2012.08.06

Project Period: 2010-2013

EXECUTIVE SUMMARY

This report was created for the National Science Foundation-Physical Building Information Modeling (NSF-PBIM) project. This report describes the analysis of a solar office building using the following software: the legacy tools (DOE 2.1e, the F-Chart and the PV-F Chart) for whole-building energy analysis, solar thermal analysis and solar electric analysis; the Revit software that was used to render the images of the solar office building and get feedback for the DOE-2.1e; and the Inverse Model Toolkit (IMT) program to transfer data between the legacy tools during the first two years of the National Science Foundation Physical Building Information Modeling (NSF PBIM) project at Texas A&M University.

The results show that the high performance solar office building reduced annual energy consumption by 100 (i.e., Net Zero) percent in both Houston and Denver as compared to a regular office building. In other words, the Net-Zero Energy Office Building which was designed with legacy tools, produces as much as or more energy than it consumes. The solar office building used different renewable energy systems, such as a solar Domestic Hot Water (DHW) system, clerestory windows, daylighting sensors and photovoltaic panels to achieve the Net-Zero Energy Building level.



ACKNOWLEDGEMENTS

We would like to acknowledge the help of Dr. Juan Carlos Baltazar Cervantes from the Energy Systems Laboratory (ESL) with the F-Chart and PV F-Chart software for the solar collectors and photovoltaic data. We would also like to acknowledge the help of Ms. Rose Sauser from the Energy Systems Laboratory (ESL) with editing this report.

This material is based upon work supported by the National Science Foundation under Grant No. 0967446. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

EXECUTIVE SUMMARY	. 1					
1 Introduction	. 7					
2 Purpose of Report	. 7					
2.1 Legacy Software Used in Report	. 7					
2.1.1 DOE-2.1.e	. 8					
2.1.2 Inverse Model Toolkit (IMT)	11					
2.1.3 F-Chart	11					
2.1.4 PV F-CHART	11					
2.1.5 Revit BIM	12					
3 Analysis of the Near Net-Zero Energy Small Solar Office Building	12					
3.1 Background of the Near Net-Zero Energy Small Solar Office Building	12					
3.2 Analysis through DOE-2.1e	16					
3.2.1 Manual Calculations using data from DOE-2.1e	16					
3.2.1.1 The First Manual Calculation.	16					
3.2.1.2 The Second Manual Calculation	18					
3.2.1.3 The Third Manual Calculation	18					
3.2.1.4 The Fourth Manual Calculation	20					
3.2.1.5 The Fifth Manual Calculation	21					
3.2.1.6 The Sixth Manual Calculation	21					
3.2.2 Analysis using the DOE-2.1e Model	21					
3.3 Analysis through Inverse Model Toolkit (IMT)	28					
3.4 Analysis through F-Chart	32					
3.5 Analysis through PV F-Chart	35					
3.6 Analysis through Revit BIM Model	38					
4 Whole Building Simulation Analyses	39					
5 Results	58					
6 Summary	59					
REFERENCES						
APPENDIX	61					

TABLE OF CONTENTS

TABLE OF FIGURES

Figure 1: NSF-PBIM Solar Office Building with underground parking spaces simulated with	
DOE-2.1e software and visualized through DrawBDL Processor.	8
Figure 2: Base case of the Complex Office Building with DrawBDL Processor	. 10
Figure 3: Base case of the Complex Office Building with DrawBDL Processor	. 10
Figure 4: Comparison of heating results for increasing exposed floor area (uninsulated) for	
Houston	. 19
Figure 5: Comparison of heating results for increasing exposed floor area (uninsulated) for	
Denver	. 20
Figure 6: Office building with all features	. 22
Figure 7: Occupancy Schedule used for Houston and Denver	. 22
Figure 8: Lighting Schedule used for Houston and Denver	. 23
Figure 9: Equipment Schedule used for Houston and Denver	. 23
Figure 10: Space characteristics input in DOE-2.1e for Houston and Denver	. 24
Figure 11: Hourly reports calculation command lines in DOE-2.1e for Loads for Houston	. 25
Figure 12: Hourly reports calculation command lines in DOE-2.1e for Loads for Denver	. 25
Figure 13: Input Systems for Loads in DOE-2.1e for Houston and Denver	. 26
Figure 14: System Input in DOE-2.1e for Houston and Denver	. 27
Figure 15: Plant Assignment Input for DHW in DOE-2.1e for Houston and Denver	. 27
Figure 16: Plant Input in DOE-2.1e for Houston and Denver	. 28
Figure 17: Monthly total heating energy consumption from SS-A report for Houston	. 29
Figure 18: Monthly total heating energy consumption from SS-A report for Denver	. 29
Figure 19: IMT file used for Houston	. 30
Figure 20: IMT file used for Denver	. 30
Figure 21: Parameters changed to run the simulation for Houston and Denver	. 31
Figure 22: IMT final result for Houston (left) and Denver (right)	32
Figure 23: Final results from F-Chart for Houston	. 35
Figure 24: Final results from F-Chart for Denver	. 35
Figure 25: Final results from PV F-Chart for Houston (Array slope = 18°)	. 37
Figure 26: Final results from PV F-Chart for Houston (Array slope = 30°)	. 37
Figure 27: Final results from PV F-Chart for Denver (Array slope = 18°)	. 38
Figure 28: Final results from PV F-Chart for Denver (Array slope = 40°)	. 38
Figure 29: Final Energy Consumption results for the Solar Office Building in Houston (PV	10
Solar Array slope = 18°)	. 42
Figure 30: Final Total Annual Energy Consumption results for the Solar Office Building in	10
Houston (PV Solar Array slope = 18°)	. 43
Figure 31: Final Energy Consumption results for the Solar Office Building in Houston (PV	45
Solar Array slope = 30°)	. 45
Figure 32: Final Total Annual Energy Consumption Results for the Solar Office Building in	10
HOUSION (PV Solar Array Slope = 50°)	. 40
Figure 55: Final Energy Consumption results for the Solar Office Building in Denver (PV So A_{max} along $= 192$)	ar
Allay $Slopt = 10^{\circ}$]	.48 W
Figure 54. Final Total Annual Consumption results for the Solar Office Building in Denver (F	V 40
Sulai Allay Slupe – 10	. 49

Figure 35: Final Energy Consumption results for the Solar Office Building in Denver (PV So	olar
Array slope = 40°)	51
Figure 36: Final Total Annual Energy Consumption results for the Solar Office Building in	
Denver (PV Solar Array slope = 40°)	52
Figure 37: BIM Office Building Model without any features	53
Figure 38: High Performance Building over the site with Trombé Wall	54
Figure 39: High Performance Building over the site with Southern Windows	55
Figure 40: High Performance Building over the site with North Windows	55
Figure 41: High Performance Building over the site with Clerestory	56
Figure 42: High Performance Building over the site with South Windows +Clerestory	56
Figure 43: High Performance Building over the site with Trombé Wall + South Windows	
+Clerestory	57
Figure 44: High Performance Building over the site with Trombé Wall + South Windows	
+North Windows + Clerestory + DHW	58

TABLE OF TABLES

Table 1: Solar Office Building Schedule 13
Table 2: PBIM Complex Office Building Matrix for Houston
Table 3: PBIM Complex Office Building Matrix for Denver 16
Table 4: LV-D Report: Details of Exterior Surfaces in the Project for Houston
Table 5: LV-D Report: Details of Exterior Surfaces in the Project for Denver
Table 6: Total Heating energy (SS-A report) and Dry Bulb temperature (Loads report) results 28
Table 7: Parameters input to F-Chart for Houston
Table 8: Parameters input to F-Chart for Denver 34
Table 9: Parameters input to PV F-Chart for Houston 36
Table 10: Parameters input to PV F-Chart for Denver 36
Table 11: Final Energy Consumption results for the Solar Office Building in Houston (PV Solar
Array slope = 18°)
Table 12: Final Energy Consumption results for the Solar Office Building in Houston (PV Solar
Array slope = 30°)
Table 13: Final Energy Consumption results for the Solar Office Building in Denver (PV Solar
Array slope = 18°)
Table 14: Final Energy Consumption results for the Solar Office Building in Denver (PV Solar
Array slope = 40°)

August 2012

1 INTRODUCTION

The College of Architecture at Texas A&M University received a grant from the National Science Foundation to study physical building information modeling Physical Building Information Modeling (PBIM). During the first two years of the project (National Science Foundation-Physical Building Information Modeling, or NSF-PBIM) several programs were used to analyze a near Net-Zero Energy Building. The analysis was carried out by the DOE-2.1e, F-Chart, PV F-Chart, Revit and Inverse Model Toolkit (IMT) programs. Each software program was reviewed for its relevancy to the project, and a base case for a building in both Houston and Denver was established. The energy savings for each base case was then calculated by running the different software.



2 PURPOSE OF REPORT

The objectives of this report are as follows:

- 1) Generate a first Revit BIM-model of a complex building for later phases of the research process.
- 2) Validate results from Loads Report from the DOE-2.1e with hand calculations.
- 3) Show how a building is simulated and how energy is saved through the use of existing simulation tools as DOE-2.1e, and the use and input of some results from this software into the F-Chart and the PV F-Chart programs.
- 4) Show a solar thermal simulation of a complex office building, through features such as solar domestic hot water; and passive thermal systems for space heating through south windows, double pane windows and clerestory, with the DOE-2.1e program.
- 2.1 Legacy Software Used in Report

The literature reviewed is the following: reports about DOE-2.1e (Building Energy Summary, 2002; Cho, 2009; Haberl and Cho, 2004a; Malhotra, 2009; US DOE, 1980a; US DOE, 1980b; Winkelmann et al., 1993); reports about IMT (Kissock et al., 2001); reports about F-Chart (Duffie and Beckman, 2006; Haberl and Cho, 2004b; Klein and Beckman, 2001b); and reports about PV F-Chart (Duffie and Beckman, 2006; Haberl and Cho, 2004c; Klein and Beckman, 2001b).

2.1.1 DOE-2.1.e

The original DOE-2 was released by the Lawrence Berkeley Laboratory by 1978 (Malhotra, 2009, p.34). We used the latest version, the DOE-2.1e, for this phase of our research. The computer language used to develop DOE-2 was FORTRAN (US DOE, 2010). The DOE-2.1e, as well as BLAST, is an hourly fixed schematic simulation, and a whole energy simulation program as TRNSYS and EnergyPlus. The DOE-2.1e allows architects and engineers to calculate energy consumption in buildings. The structure of the input code is formed by four simulation subprograms. These four subprograms are named as Loads, Systems, Plant and Economics are executed in sequence through the input code. The output is built by the Loads, Systems, Plant and Economics Reports. The software needs binary weather files for weather data calculations. These are usually TMY2 files. We used the Houston and Denver TMY2 weather files for the simulation. The binary files used for Houston were *houstontmy2* and Boulder (*bouldeco*) was used for the Denver simulations. DOE-2.1e uses BDL Processor software to transform the input file into a basic 3D-Model. BDL Processor allowed us to visualize the building from early stages.



Figure 1: NSF-PBIM Solar Office Building with underground parking spaces simulated with DOE-2.1e software and visualized through DrawBDL Processor.

The proposed office building has a north-south orientation. The building envelope has floor, walls and tilted roofs. It was lifted 10 ft. in the air to avoid the heat transfer with the ground and accommodate a parking lot. The next features were simulated for both climates in order to save energy and achieve near Net-Zero Energy consumption: passive solar, daylighting saving controls, solar thermal energy (domestic hot water) and solar electric energy (photovoltaic). Figure 2 shows the office building with all the used features (southern and northern windows, clerestory, daylighting sensors, domestic hot water and photovoltaic).

The DOE-2.1 uses DOS files that are run to a DOE-2 application. These are the applications: DOE-2.1e applications:

• shortcut_DOE2_console: It runs the simulation.

• BDL Processor (subprogram): It transforms the input file into a basic 3D-Model. File formats:

- .inp: input file
- .log: log file
- .out: output file

Modeling process:

- The user creates the input (.inp) file writing down the building description, loads, system, plant and economics.
- The shortcut_DOE2_console is open and the next line command is typed: "doe21e", "name of the file" and "weather data file"
- The output (.out) file is produced after the simulation is over.
- The building can be visualized with the input (.inp) file through the BDL Processor.



Figure 2: Base case of the Complex Office Building with DrawBDL Processor



Figure 3: Base case of the Complex Office Building with DrawBDL Processor

2.1.2 Inverse Model Toolkit (IMT)

The ASHRAE's Inverse Model Toolkit (Cho and Haberl, 2004) is a Fortran 90 application used to calculate the linear, change-point linear, variable-based degree-day, multi-linear and combined regression models. The IMT was sponsored by the ASHRAE research project RP-1050 under the guide of the Technical Committee 4.7, Energy Calculations. The IMT was used in order to calculate the heat loss coefficient (Building UA) that needs to be input in the F-Chart software.

2.1.3 F-Chart

Researchers at the University of Wisconsin Solar Laboratory developed a program for the analysis and design of solar thermal systems: the F-Chart (Klein and Beckman, 2001a, p.1). The f-chart method that is used in this software provides an estimated fraction of a total heating load that will be supplied by solar energy for a given system (Duffie and Beckman, 2006, p.673). The program can estimate the performance of an array of features such as: domestic water heating systems, pebble bed storage space and domestic water heating systems, water storage space and domestic water heating systems, collector storage wall passive systems, pool heating systems, general solar heating systems and integral collector-storage domestic water heating systems. We analyzed a feature for the complex building for Houston and Denver: an active solar collection with building storage (DHW). The weather data was supplied by the California Energy Commission.

The following are the F-Chart applications, files generated and the modeling process: F-Chart applications:

• It does not have any additional applications.

File formats:

• .FC: output files

Modeling process:

- The user selects the system, type of collector, weather and economic parametric, and fills down each window with the information.
- The user runs the calculation and obtains two windows: thermal output and economic output.
- The file can be save as *.FC with all the data input.

2.1.4 PV F-CHART

For this analysis the PV F software used was developed by researchers at the University of Wisconsin Solar Laboratory. This program was intended for the design and economic analysis of photovoltaic systems (Klein and Beckman, 2001b, p.1). The PV f-chart method that is used in this software consists of a combination of correlations for the hourly calculations of solar radiation at a certain place (Malhotra, 2009, p.36). The program can estimate the performance of an array of features such as: utility interface systems, battery storage systems and systems with no interface or battery storage. We analyzed a photovoltaic system for the complex building for Houston and Denver. The weather data was supplied by the California Energy Commission. The following are the PV F-Chart applications, files generated and the modeling process: PV F-Chart applications:

• It does not have any additional applications. File formats:

• .PVF: output files

Modeling process:

- The user selects the system, weather and economic parametric, and fills down each window with the information.
- The user runs the calculation and obtains two windows: system performance and economic results.
- The file can be save as *.PVF with all the data input.
- •

2.1.5 Revit BIM

Revit is a software program that uses a platform involved in architecture, structural engineering and mechanical engineering, and uses parametric design in order to achieve the tasks in each field (Dzambazova et al., 2009, p.10). The Building Information Modeling (BIM) is an application that targets problems from industry: communication, coordination and change management. It also provides the following possibilities: the projects are ready to go directly to fabrication, digital shop drawing submittals, and 4D construction planning (Dzambazova et al., 2009, p.10).

3 ANALYSIS OF THE NEAR NET-ZERO ENERGY SMALL SOLAR OFFICE BUILDING

The analysis of the near Net-Zero Energy small building simulation will involve the next steps:

- Background of the near net-zero small near Net-Zero Energy small solar office building;
- Analysis through DOE-2.1e;
- Analysis through the Inverse Model Toolkit (IMT);
- Analysis through F-Chart;
- Analysis through PV F-Chart; and
- Visualization of the Revit BIM Model.
- 3.1 Background of the Near Net-Zero Energy Small Solar Office Building

The analysis for this period consisted in simulating the complex office building in DOE-2.1e, F-Chart and PV F-Chart for Houston and Denver. The office building was lifted 10 feet in the air to avoid the heat transfer with the ground. Also, this was meant to represent a building with parking underneath. The building envelope consists of walls, roof and floor. Table 1 is the description of the near Net Zero small office building.

Location	Houston, TX (29° Latitude, 95° Longitude, 108 ft. Altitude)	Denver, CO (39° Latitude, 104° Longitude, 5,413 ft. Altitude)				
Weather data file used for simulation	houstontmy2	Bouldeco				
Building floor plan	50 ft. X 100 ft.	50 ft. X 100 ft.				
Building orientation	North-south	North-south				
Area of the building	5,000 ft²	5,000 ft²				
Volume of the building	70,000 ft ³	70,000 ft ³				
Spaces used for building simulation	1	1				
Wall construction (from outside to inside)						
Air layer	0.5 in.	0.5 in.				
Brick	4 in.	4 in.				
Plastic-film						
Plywood	0.5 in.	0.5 in.				
Batt insulation	4 in. (R-11)	6 in. (R-19)				
Gypsum	0.5 in.	0.5 in.				
Air layer	0.5 in.	0.5 in.				
Roof construction (from outside to inside)						
Roof gravel	0.5 in.	0.5 in.				
Built up Roofing Material	0.4 in.	0.4 in.				
Polystyrene	5 in.	5 in.				
Soft Wood	0.75 in.	0.75 in.				
Height of the front and back walls	8 ft.	8 ft.				
Tilt of the roofs						
South roof	17.79°	17.79°				
North roof	32.62°	32.62°				
Total surface of walls	3,800 ft ²	3,800 ft ²				
Total surface of roofs	6,940.96 ft²	6,940.96 ft ²				
System	VAV (Variable-Air-Volume)	VAV (Variable-Air-Volume)				
Cooling	78°F	78°F				
Heating	68°F	68°F				
Design degree days						
Summer	August 9th	August 25 th				
Winter	January 14th	February 3 rd				

Table 1: Solar Office Building Schedule

Table 2 is the list of simulations for the near net zero building in Houston. Table 3 is the list of simulations for the near net zero building in Denver. The two tables were created during the first year of the NSF-PBIM project. Each table has a matrix with the files developed and analyzed for Houston and Denver. The analysis was done with the DOE-2.1e software. Six manual calculations were done in order to calibrate the model.

The matrix is made up of nine steps:

- Step One Simulations were run from the files 01A1a_0aH and 01A2a_0aD until 01A1a_8aH and 01A2a_8aD.
- Step Two:-Cross check of energy analysis simulations vs. manual calculations.
- **Step Three**: First manual calculation after simulating the files 01A1a_0aH and 01A2a_0aD. The first manual calculation is a cross check to verify if the U-Values in the simulation file meet or exceed the values of the code compliance *ASHRAE Standard 90.1-2007 Energy Standard for Buildings except Low-Rise Residential Buildings IP Edition*-
- **Step Four** –The second manual calculation compares the result of the steady-state "q" U-Value and the heating results for the LS-C Building Peak Load component report from the 01A1a_0aH file for Houston and the 01A2a_0aD for Denver.
- Step Five The third manual calculation tested the sensitivity of the size of the floor compared to the overall peak load. The analysis involved the comparison of the heating results from the LS-C Building Peak Load component between the basecase and several case files for Houston and Denver: 01A1a_1caH and 01A2a_1caD, 01A1a_1daH and 01A2a_1daD, 01A1a_1eaH and 01A2a_1eaD, and 01A1a_1faH and 01A2a_1faD, for Houston and Denver respectively. This will compare heating results (base case vs. Houston/Denver).
- Step Six The fourth manual calculation is for a building with insulated floor in both Houston and Denver. The file 01A1a_2aH is for Houston and the file 01A2a_2aD is for Denver-
- **Step Seven** The fifth manual calculation shows the added south façade fenestration to the files 01A1a_4aH and 01A2a_4aD:
- Step Eight The sixth manual calculation shows the added total façade fenestration to the files 01A1a_8aH and 01A2a_8aD.
- Step Nine Run simulations from 01A1a_9aH and 01A2a_9aD until 01A1a_19aH and 01A2a_19aD.

This is the matrix used for the files for both Houston and Denver in Table 2 and Table 3:

- Column 1 is ID Name given to the file.
- Column 2 is the File Name assigned to each one of the files simulated through DOE-2.1e.
- Column 3 is called PBIM Folder (Folder Localization). It shows the features that were simulated during the analysis process.
- Columns 4 through 24 have each one of the features that were simulated during the analysis process.

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CASE 0aH	01A1a 0aH	VAVS	X	X		X		0 0	1 01	ш (л	-	0,	X			01	~		0	-	01		
CASE 1aH	01A1a_1aH	VAVS (FLOOR = WALL)	х	х		Х	х						Х										
CASE 1baH	01A1a_1baH	VAVS (HEAVY CONCRETE SLAB ONLY (25' X 50'))	Х	Х		Х	Х						Х										
CASE 1caH	01A1a_1caH	VAVS (HEAVY CONCRETE SLAB ONLY (50' X 50'))	х	х		Х	х						Х										
CASE 1daH	01A1a_1daH	VAVS (HEAVY CONCRETE SLAB ONLY (50' X 100'))	х	х		Х	х						Х										
CASE 1eaH	01A1a_1eaH	VAVS (HEAVY CONCRETE SLAB ONLY (50' X 150'))	X	х		X	X						X										
CASE 1faH	01A1a_1faH	VAVS (HEAVY CONCRETE SLAB ONLY (50' X 200'))	x	х		Х	х						X		_							<u> </u>	
CASE 1 mold	01415 1054	VAVS (HEAVY CONCRETE SLAB (50 X 100) + 4	.	~		~							v									1 /	
CASE 1gan	OIAIa_igan	VAVS (HEAVY CONCRETE SLAB (50' X 100') + 20"	^	~		~	^						~		-			-				— — /	
CASE 1haH	01A1a 1haH	POLYSTYRENE)	х	х		х	х						х									1 /	
CASE 2H	01A1a_2H	SUM + Plant	х	Х	х		х			х		Х		х									
CASE 2aH	01A1a_2aH	VAVS + Plant	х	х	х		х			х			Х	х									
CASE 3H	01A1a_3H	SUM + Plant + Trombe wall	х	Х		Х	х			х		Х		х						х			
CASE 3aH	01A1a_3aH	VAVS + Plant + Trombe wall	х	Х		Х	х			х			Х	х						х			
CASE 4H	01A1a_4H	SUM + Plant + South window	х	х		Х	х			х		Х		х		Х							
CASE 4aH	01A1a_4aH	VAVS + Plant + South window	X	X		X	X			X		V	X	X		Х	V					لسم	
CASE 5H	01A1a_5H	VAVS + Plant + North windows	×	×		×	×			×		×	v	X			×						
CASE Sam	01A1a_6H	SIIM + Plant + Clerestory	X	X		x	X			X		×	^	X			~		x				
CASE 6aH	01A1a_6aH	VAVS + Plant + Clerestory	x	x		X	x			x		~	x	x					X				
CASE 7H	01A1a 7H	SUM + Plant + South window + Clerestory	x	X		X	X			X		х		X		х			X				
CASE 7aH	01A1a 7aH	VAVS + Plant + South window + Clerestory	X	х		X	X			x			х	x		X			X				
	_	VAVS + Plant + South window + north windows +																					
CASE 8H	01A1a_8H	Clerestory	х	х		х	х			х		х		х		х	х		х				
		VAVS + Plant + South window + north windows +																				1 /	
CASE 8aH	01A1a_8aH	Clerestory	х	Х		Х	х			х			Х	х		Х	Х		х				
																						1 /	
CASE 9H	01A1a_9H	SUM + Plant + Trombe wall + South window + Clerestory	X	х		Х	х			x		X		х		Х	Х		х	x			
CACE 0-11	0141- 0-11	VAVS + Plant + Irombe wall + South window +	~	v		v	~			~			v	~		v	v		v	~		1 /	
CASE 98H	UTAT9_99H	SUM + Plant + Trombe wall + South window + north	~			~	^			^			^	~	_					^		\square	_
CASE 10H	01A1a 10H	windows + Clerestory	x	x		x	x			x		х		x		х	x			x		1 /	
		VAVS + Plant + Trombe wall + South window + north																					
CASE 10aH	01A1a_10aH	windows + Clerestory	х	х		х	х			х			х	х		х	х			х		1 /	
		SUM + Plant + Trombe wall + People + Occupancy sched																					
CASE 11H	01A1a_11H	+ South window + north windows + Clerestory	х	х		Х	х	Х		Х		Х		х	х	Х	Х		Х	х			
		VAVS + Plant + Trombe wall + People + Occupancy sched																				1 /	
CASE 11aH	01A1a_11aH	+ South window + north windows + Clerestory	х	Х		Х	х	х		х			Х	х	х	Х	Х		Х	х			
0.05.000		SUM + People + Occupancy sched + South window +																					
CASE 12H	01A1a_12H	North Windows + Clerestory + DHW	X	X		X	x	x		x		X		X	x	X	X		x		X	⊢ /	
CASE 12aH	01A1a 12aH	north windows + Clerestory + DHW	×	x		x	x	×		x			x	×	x	x	x		×		×		
0/02 12011	cirtid_iidiii	SUM + South window + north windows + Clerestory +	~	~		~	~	~		~		_	~	~	~	~	~		~		~		
CASE 13H	01A1a 13H	DHW	х	х		х	х			х		х		х		х	х		х		х		
		VAVS + South window + north windows + Clerestory +																					
CASE 13aH	01A1a_13aH	DHW	х	х		Х	х			х			х	х		х	х		х		х	لكم	
		SUM + Plant + South window + north windows +																					
CASE 14H	01A1a_14H	Clerestory + Daylighting sensors	X	х		Х	х			x		X		х		Х	X		х			L X	X
		VAVS + Plant + South window + north windows +																					
CASE 14aH	01A1a_14aH	Clerestory + Daylighting sensors	x	х		Х	х			x			X	х		Х	X		х				x
		SLIM + Plant + Trombe wall + People + Occupancy sched																				1 /	
CASE 15H	01415 15H	+ South window + north windows + Clerestony + doors	v	v		v	v	v		v		v		v	v	v	v	v	v	v		1 /	
CASE ISH	01A18_1511	1 South white white white white white was a clerestory record	<u>^</u>	~		^	^	~		^		~		^	^	~	^	Ê	~	Â		— — /	
		VAVS + Plant + Trombe wall + People + Occupancy sched																				1 /	
CASE 15aH	01A1a_15aH	+ South window + north windows + Clerestory + doors	х	х		х	х	х		х			х	х	х	х	х	х	х	х		1 /	
CASE 16H	01A1a_16H	SUM + DHW	х	х		х	х			х		х		х							Х		
CASE 16aH	01A1a_16aH	VAVS + DHW	X	X		X	X			X			х	X							Х	ليبي	
CASE 17H	U1A1a_17H	SUM + Photovoltaic	X	X		X	X			X		х		X									X
CASE 17aH	ULA1a_17aH	VAVS + Photovoltaic	X	X		X	X			X		×	X	X									X
CASE 181	01A1a_18H	VAVS + Plant + Doors	×	×		×	×			×		×	Y	X		_		+ ×					
CASE 19H	01A1a 19H	SUM (All features)	x	X		×	Ŷ			x		×		X	x	X	×	×	×	×	×	×	×
CASE 19aH	01A1a 19aH	VAVS (All features)	x	X		x	x			x		~	x	X	x	x	x	x	X	x	x	X	x
					_							_											

Table 2: PBIM Complex Office Building Matrix for Houston

	1		r –	r –		цт.	1	1				5			- 1			1					
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			<u>o</u>	¥.	б	5		∑		±	2	d,	₽			N	ž		Ę.	AN AN	E .	ž	5
			~	đ	Śн	2		A B	DLE VG	- AE	۲¥.	1-T	÷			>	≥		6	ы.		H S	Ň
			¥	6	<u>a</u> 5	ā	Ж К	5 <u>a</u>	Ē		Ë,	E	Ξs	F	2	Ŧ	Ē	BRS	ES .	ž	A R	S LIG	6
ID NAME		PRIMEOLDER (FOLDER LOCALIZATION)	E	DES	글 분	⊒	2	8 S	흐 풍	E G	Ξ	.s.v	S ₹	7	8	5	ğ	ğ	E	۵ ۵	0	EN AV	H
CASE 0aD	01423 030	VAVS	v	v		v		0 0,	10,		-	01	v			01	-			F	01		
CASE 1aD	01428_080	VAVS (ELOOR - WALL)	Ŷ	Ŷ		Ŷ	v						×		_								
CASE 18D	01A28_18D	VAVS (FEOOR - WALL)	÷	<u>^</u>		<u></u>	^ 						~		_								_
CASE 1baD	01A2a_1baD	VAVS (HEAVY CONCRETE SLAB ONLY (25' X 50'))	х	х		X	х						X		_								
CASE 1caD	01A2a_1caD	VAVS (HEAVY CONCRETE SLAB ONLY (50' X 50'))	х	х		х	х						х										
CASE 1daD	01A2a_1daD	VAVS (HEAVY CONCRETE SLAB ONLY (50' X 100'))	Х	Х		Х	Х						Х										
CASE 1eaD	01A2a_1eaD	VAVS (HEAVY CONCRETE SLAB ONLY (50' X 150'))	Х	Х		х	Х						х										
CASE 1faD	01A2a_1faD	VAVS (HEAVY CONCRETE SLAB ONLY (50' X 200'))	х	х		х	х						х										
		VAVS (HEAVY CONCRETE SLAB (50' X 100') + 4"																					
CASE 1gaD	01A2a 1gaD	POLYSTYRENE)	x	х		x	х						х										
		VAVS (HEAVY CONCRETE SLAB (50' X 100') + 20"																					
CASE 1haD	01A2a 1haD	POLYSTYRENE)	x	x		x	x						x										
CASE 2D	0142a 2D	SUM + Plant	x	x	x		X			x		x		x	_								
CACE 2-D	0142-2-0	VANC - DI+	v v	× ×	× ×		× ×			× ×		~	v	v	-								
CASE 200	UIAZa_ZaD	VAVS+Plant	<u>^</u>	×	^		<u>^</u>			×		N.		~	_					N.			—
CASE 3D	UIAZa_3D	SUM + Plant + frombe wall	X	X		X	X			X		X		X	_					X			_
CASE 3aD	01A2a_3aD	VAVS + Plant + Trombe wall	х	х		х	х			х			X	х						X			
CASE 4D	01A2a_4D	SUM + Plant + South window	Х	Х		х	Х			х		Х		Х		Х							
CASE 4aD	01A2a_4aD	VAVS + Plant + South window	Х	х		Х	Х			Х			Х	Х		Х							
CASE 5D	01A2a_5D	SUM + Plant + North windows	х	х		Х	х			х		х		х			Х						
CASE 5aD	01A2a_5aD	VAVS + Plant + North windows	х	х		Х	Х			х			х	х			Х						
CASE 6D	01A2a 6D	SUM + Plant + Clerestory	х	х		Х	х			х		х		х					х				
CASE 6aD	01A2a 6aD	VAVS + Plant + Clerestory	х	х		Х	х			х			х	х					х				
CASE 7D	01029 70	SLIM + Plant + South window + Clerestony	v	×		v	v			Y		Y		v		Y			v				
CASE 75D	01420_70	VAVE + Plant + South window + Clarastony	Ŷ	v		Ŷ	Ŷ			×		~	v	Ŷ	-	×			×				—
CASE 78D	UIA2a_7aD	VAVS + Plant + South window + clerestory	^	^		^	^			^			^	^	-	~			^				
		VAVS + Plant + South Window + north Windows +																					
CASE 8D	01A2a_8D	Clerestory	х	х		X	х			X		X		х	_	Х	X		X				
		VAVS + Plant + South window + north windows +																					
CASE 8aD	01A2a_8aD	Clerestory	Х	Х		Х	Х			Х			Х	Х		Х	Х		Х				
CASE 9D	01A2a_9D	SUM + Plant + Trombe wall + South window + Clerestory	х	х		х	х			х		х		х		х	х		х	х			
		VAVS + Plant + Trombe wall + South window +																					
CASE 9aD	01A2a 9aD	Clerestory	x	x		x	x			х			x	x		х	x		х	х			
		SLIM + Plant + Trombe wall + South window + north																					
CASE 10D	01423 100	windows + Clerestony	v	v		v	v			v		×		v		×	v			v			
CASE 100	01A28_100	VAVE - Diant - Trombo wall - South window - north		^		^	^			^		~		^	-	~	~			~			
		VAVS+Plant+frombe wall+ South window+horth																					
CASE 10aD	01A2a_10aD	windows + Clerestory	х	х		X	х			X			X	х	_	X	X			X			
		SUM + Plant + Trombe wall + People + Occupancy sched																					
CASE 11D	01A2a_11D	+ South window + north windows + Clerestory	Х	х		х	Х	х		х		Х		х	Х	Х	Х		Х	Х			
		VAVS + Plant + Trombe wall + People + Occupancy sched																					
CASE 11aD	01A2a_11aD	+ South window + north windows + Clerestory	х	х		х	х	х		х			х	х	х	х	х		х	х			
		SUM + People + Occupancy sched + South window +																					
CASE 12D	01A2a 12D	north windows + Clerestory + DHW	x	х		x	х	x		х		х		х	x	х	х		х		х		
		VAVS + People + Occupancy sched + South window +																					
CASE 12aD	0142a 12aD	north windows + Clerestory + DHW	x	x		×	x	×		x			x	x	x	×	x		x		x		
0/02/1200	010/120_1200	SUM : South window : parth windows : Claraston :		~		~	~	~		~			~	~	~	~	~		~		~		<u> </u>
CACE 13D	014.2- 120	Solit + South whidow + horth whidows + clerestory +	~	~		~	~			~		v		~		v	v		v		~		
CU3E 130	01828_130	VAVS + South window + north windows + Claracters	<u> </u>	^		· ^	<u> </u>			^		^		^		^	~		~		-		
0.05 40 D		VAVS + South whidow + horth whidows + clerestory +																					
CASE 138D	UIA2a_13aD	Unw	×	X		X	×			X			×	X		X	X		X		×		
		SUNI + Plant + South Window + north Windows +	Ι.	١.			1.																
CASE 14D	01A2a_14D	Clerestory + Daylighting sensors	Х	Х		х	Х			х		Х		Х		Х	Х		Х			Х	х
		VAVS + Plant + South window + north windows +																					
CASE 14aD	01A2a 14aD	Clerestory + Daylighting sensors	х	х		х	х			х			х	х		х	х		х			х	х
		SUM + Plant + Trombe wall + People + Occupancy sched																					
CASE 15D	01423 150	+ South window + porth windows + Clereston + doors	v	v		v	v	v		v		×		v	v	×	v	v	v	v			
0102 100	01/120_150	· south white with the termination of termination of the termination of ter	Ê	~		~	~	~		~		A		~	~	~	~	^	~	~			
		VAVE - Diant - Trombo wall - Dooplo - Occupancy school																					
		VAVS + Plant + frombe wall + People + Occupancy sched																					
CASE 15aD	01A2a_15aD	+ South window + north windows + Clerestory + doors	х	х		X	х	X		X			X	х	X	X	X	х	X	X			
CASE 16D	01A2a_16D	SUM + DHW	Х	Х		Х	Х			х		Х		Х							Х		
			1																				
CASE 16aD	01A2a_16aD	VAVS + DHW	х	х		Х	х			х			х	х							х		
CASE 17D	01A2a_17D	SUM + Photovoltaic	Х	х		Х	Х			х		х		Х									х
CASE 17aD	01A2a 17aD	VAVS + Photovoltaic	х	х		Х	х			х			х	х									х
CASE 18D	01A2a_18D	SUM + Plant + Doors	x	x		x	x			x		x		x				x					
CASE 18aD	0142a 18aD	VAVS + Plant + Doors	x	x		x	x			x		~	×	x				x					
CASE 10D	01429 100	SLIM (All features)	Ŷ	Ŷ		Ŷ	Û			× ×		Y	^	Ŷ	v	Y	v	Ŷ	v	v	Y	Y	V
CASE 10-D	01428_190		÷	~ ~		- V	÷			~		^	×	$\hat{\mathbf{v}}$	÷	~	×		~	~		~	- Û
CMPE 129D	DTM59_189D	vAva (All features)	X	x		X	I X			X			X	x	^	x	X	Ň	X	X	X	X	^

Table 3: PBIM Complex Office Building Matrix for Denver

3.2 Analysis through DOE-2.1e

3.2.1 Manual Calculations using data from DOE-2.1e

The first simulations in DOE-2.1e were run and the next elements were found: one validation through code compliance and five manual calculations.

3.2.1.1 The First Manual Calculation.

The first manual calculation is a cross check that the U-Values in the simulation file meet or exceed the values of the code compliance ASHRAE Standard 90.1-2007 Energy Standard for Buildings except Low-Rise Residential Buildings.. If we look at the 01A1a_0aH file, the U-value of walls and roofs in the LV-D details in the exterior surfaces in the project report are 0.06

and 0.043, respectively (See Table 4). Table 5.5-2 for Building Envelope Requirements for Climate Zone 2 (Houston) in the *ASHRAE Standard 90.1-2007 Energy Standard for Buildings except Low-Rise Residential Buildings IP Edition* says that a wall, above grade—wood-framed and other – needs a U-value of 0.089 and that a roof with insulation entirely above deck needs a U-value of 0.048. Therefore, the building complies with the *ASHRAE Standard 90.1-2007 code* in terms of building envelope requirements.

Table 4: LV-D Report: Details of Exterior Surfaces in the Project for Houston

1NSF PROJECT	0.0	TEST CASE-1	2.00		DOE-2.1E	-119 Sat Dec 18 1	17:32:37 20	10LDL RUN 1
REPORT- LV-D DE	TAILS OF EXTERIOR	SURFACES IN THE PROJ	ECT			WEATHER FILE- H	Houston TX	тмү2
NUMBER OF EXTERIO	OR SURFACES 7 S OUTSIDE AIR FILM	RECTANGULAR 4; WINDOW INCLUDES FR	5 O AME, IF	THER 2 DEFINED)				
SURFACE	SPACE	W I N D O W S U-VALUE (BTU/HR-SQFT-F)	AREA (SQFT)	W A L L U-VALUE (BTU/HR-SQFT-F)	AREA (SQFT)	-W A L L + W I N U-VALUE (BTU/HR-SQFT-F)	D O W S- AREA (SQFT)	AZIMUTH
BACK-1	SPACE1-1	0.000	0.00	0.060	800.00	0.060	800.00	NORTH
TOP-2	SPACE1-1	0.000	0.00	0.043	3780.40	0.043	3780.40	NORTH
RIGHT-1	SPACE1-1	0.000	0.00	0.060	700.00	0.060	700.00	EAST
FRONT-2	SPACE1-1	0.000	0.00	0.060	800.00	0.060	800.00	SOUTH
TOP-1	SPACE1-1	0.000	0.00	0.043	3160.56	0.043	3160.56	SOUTH
FRONT-1	SPACE1-1	0.000	0.00	0.060	800.00	0.060	800.00	SOUTH
LEFT-1	SPACE1-1	0.000	0.00	0.060	700.00	0.060	700.00	WEST

On the other hand, if we look at the 01A2a_0aD file for Denver, the U-value of walls and roofs in the LV-D Details in the Exterior Surfaces in the Project report are 0.04 and 0.043, respectively (See Table 5). Table 5.5-5 for Building Envelope Requirements for Climate Zone 5 (Denver) in the ASHRAE Standard 90.1-2007 Energy Standard for Buildings except Low-Rise Residential Buildings IP Edition says that a wall, above grade—wood-framed and other – needs a U-value of 0.064 and that a roof with insulation entirely above deck needs a U-value of 0.048. Therefore, the building complies with the code in terms of building envelope requirements.

1NSF PROJECT		TEST CASE-1			DOE-2.1E	-119 Mon Aug 15	13:26:40 20	11LDL RUN 1
REPORT- LV-D DET	TAILS OF EXTERIOR	SURFACES IN THE PRO:	јест			WEATHER FILE-	Boulder	со тму2
NUMBER OF EXTERIO	OR SURFACES 7	RECTANGULAR		THER 2				
(O TALOL INCLOSE		, 111001 111110010 11						
SURFACE	SPACE	WINDOWS	5 AREA	WALL U-VALUE	AREA	-WALL+WIN	DOWS- AREA	AZIMUTH
		(BTU/HR-SQFT-F)	(SQFT)	(BTU/HR-SQFT-F)	(SQFT)	(BTU/HR-SQFT-F)	(SQFT)	
BACK-1	SPACE1-1	0.000	0.00	0.040	800.00	0.040	800.00	NORTH
TOP-2	SPACE1-1	0.000	0.00	0.043	3780.40	0.043	3780.40	NORTH
RIGHT-1	SPACE1-1	0.000	0.00	0.040	700.00	0.040	700.00	EAST
FRONT-2	SPACE1-1	0.000	0.00	0.040	800.00	0.040	800.00	SOUTH
TOP-1	SPACE1-1	0.000	0.00	0.043	3160.56	0.043	3160.56	SOUTH
FRONT-1	SPACE1-1	0.000	0.00	0.040	800.00	0.040	800.00	SOUTH
LEFT-1	SPACE1-1	0.000	0.00	0.040	700.00	0.040	700.00	WEST

Table 5: LV-D Report: Details of Exterior Surfaces in the Project for Denver

3.2.1.2 The Second Manual Calculation

The second manual calculation compares the result of the steady-state "q" U-Value and the heating results for the LS-C Building Peak Load component report from the 01A1a_0aH file for Houston

q (Houston) = U x A x (Δt) U-value walls = 0.06 U-value roofs = 0.043 A = 3,800 ft² (walls) A = 6,941 ft² (roofs) (Δt) = 73 - 32 = 41°F (NOTE: A temperature of 32°F is used in the calculation for the winter design degree day.

q = 20,005 Btu/hr.

The heating results for the LS-C Building Peak Load for the Houston component are 22,590 Btu/hr. The difference between the simulation and the manual calculation is 2,584.48 Btu/hr. The 6% difference is considered acceptable. The calculation difference should not be more than 10 %. Therefore, the simulation for Houston is working.

The following data was taken from the LS-C Building Peak Load component report from the 01A2a_0aD file for Denver:

 $\begin{array}{l} q \;(Denver) = U \; x \; A \; x \; (\Delta t) \\ U \text{-value walls} = 0.04 \\ U \text{-value roofs} = 0.043 \\ A = 3,800 \; \text{ft}^2 \;(\text{walls}) \\ A = 6,941 \; \text{ft}^2 \;(\text{roofs}) \\ (\Delta t) = \text{For Denver, an outside temperature of 72 is used73 - 1 = 72°F (NOTE: The 1°F is a temperature input in the winter design degree day. } q = 32,433 \; \text{Btu/hr.} \end{array}$

The heating results for the LS-C Building Peak Load for the Denver component are 32,960 Btu/hr. The difference between both numbers (527 Btu/hr.) will represent 1%. The calculation difference should not be more than 10 %. Therefore, the simulation for Denver is working, too.

3.2.1.3 The Third Manual Calculation

The third manual calculation tested the sensitivity of the size of the floor compared to the overall peak load. The analysis involved the comparison of the heating results from the LS-C Building Peak Load component between the basecase and several case files for Houston and Denver (see Figure 4 and Figure 5). For this simulation the building remained 10 ft. in the air and a floor was added to the building to the original 01A1a_0aH and 01A2a_0aD files for Houston and Denver, respectively. Then, the floor was changed into different sizes:

- a. Half size (50 ft. X 50 ft.),
- b. Total floor plan size (50 ft. X 100 ft.),
- c. 150 % size (50 ft. X 150 ft.) and
- d. 200 % size (50 ft. X 200 ft.)

These floor sizes correspond to the files 01A1a_1caH and 01A2a_1caD, 01A1a_1daH and 01A2a_1daD, 01A1a_1eaH and 01A2a_1eaD, and 01A1a_1faH and 01A2a_1faD, for Houston and Denver respectively. The results from the heating component of the files 01A1a_0aH,

01A1a_1caH, 01A1a_1daH, 01A1a_1eaH and 01A1a_1faH and 01A2a_0aD, 01A2a_1caD, 01A2a_1daD, 01A2a_1eaD and 01A2a_1faD showed a linear result. This linear result responded and increased due to the placement and size of the floor.









3.2.1.4 The Fourth Manual Calculation

The fourth manual calculation is for a building with insulated floor in both Houston and Denver. The method used for this calculation is found in the article *Underground Surfaces: How to get a better Underground Surface Heat Transfer Calculation in DOE-2.1e* by Fred Winkelmann (Building Energy Summary, 2002, p.19). The file 01A1a_2aH is for Houston and the file 01A2a_2aD is for Denver.

For Houston, we thought about a foundation depth of 4 ft. with R-10 exterior insulation (F2 = 0.50 Btu/hr-F-ft.) The average resistance film for heat flow up is 0.77 hr-ft²-F/Btu (Rfilm).

Slab surface area:	$A = 50*100 = 5,000 \text{ ft}^2$
Slab exposed perimeter:	Pexp = (2*50) + (2*100) = 300 ft.
Effective slab resistance:	Reff = A/(F2*Pexp) = 5000/(0.50*300) = 33.3
Effective slab U-value:	U-Effective = $1/\text{Reff} = 0.030$
Actual slab resistance:	Rus = 0.44 + Rfilm = 0.44 + 0.77 = 1.21
Resistance of fictitious layer:	Rfic = Reff - Rus - Rsoil = 33.3 - 1.21 - 1.0 = 31.1

For Denver, we thought about a foundation depth of 4 ft. with R-20 exterior insulation (F2 = 0.40 Btu/hr-F-ft.) The average resistance film for heat flow up is 0.77 hr-ft²-F/Btu (Rfilm).

Slab surface area:	$A = 50*100 = 5,000 \text{ ft}^2$
Slab exposed perimeter:	Pexp = (2*50) + (2*100) = 300 ft.

Effective slab resistance:	$\text{Reff} = \text{A}/(\text{F2*Pexp}) = 5000/(0.40*\ 300) = 41.66$
Effective slab U-value:	U-Effective = $1/\text{Reff} = 0.024$
Actual slab resistance:	Rus = 0.44 + Rfilm = 0.44 + 0.77 = 1.21
Resistance of fictitious layer:	Rfic = Reff - Rus - Rsoil = 41.66 - 1.21 - 1.0 = 39.45

3.2.1.5 The Fifth Manual Calculation

The fifth manual calculation shows the added south façade fenestration to the files $01A1a_4aH$ and $01A2a_4aD$:

-The upper and lower south walls have 800 ft² each one (8 ft. X 100 ft.) -South window = 45 X 4 = 180 ft² -Clerestory = 90 X 3 = 270 ft² -Window-to-wall ratio = South window (Lower south wall) = 33.75% Clerestory (Upper south wall) = 22.5%

This means that 1/3 of the area of the lower south wall is glass and $\frac{1}{4}$ (approx.) of the area of the upper south wall is glass. Also, if we add the areas of both walls and windows (separately), we will see that the total area of south wall is 1,600 ft², the total window area is 450 ft² and that the window-to-wall ratio will be 28%. Therefore, $\frac{1}{4}$ of the area of the south wall is only glass. The windows are the weakest elements in the thermal simulation.

3.2.1.6 The Sixth Manual Calculation

The sixth manual calculation shows the added total façade fenestration to the files 01A1a_8aH and 01A2a_8aD:

-The upper and lower south walls have 800 ft² each one (8 ft. X 100 ft.) -South window = 45 X 4 = 180 ft² -Trombé wall window = 50 X 8 = 400 ft² -Clerestory = 90 X 3 = 270 ft² -North windows = 24 X 4 = 96 ft² X 2 = 192 ft² -Window-to-wall ratio = South window (Lower south wall) = 72.5% Clerestory (Upper south wall) = 22.5% North window = 24%

This means that 2/3 of the area of the lower south wall is glass, $\frac{1}{4}$ (approx.) of the area of the upper south wall is glass and $\frac{1}{4}$ of the area of the north wall is glass. In addition, if we add the areas of both walls and windows separately, we will see that the total area of the south wall is 1,600 ft², the total window area is 850 ft² and that the window-to-wall ratio will be 53% for south. Therefore, 1/2 of the area of the south and $\frac{1}{4}$ of the area of the north walls are only glass. The windows are the weakest elements in the thermal simulation.

3.2.2 Analysis using the DOE-2.1e Model

The files used for the final analysis in DOE-2.1e are the 01A1a_19aH for Houston and the 01A2a_19aD for Denver. The next features were simulated for both climates in order to save energy and achieve net-zero energy consumption: passive solar, daylighting saving controls, solar thermal energy (domestic hot water) and solar electric energy (photovoltaic). Figure 6 shows the office building with all the used features (southern and northern windows, clerestory, daylighting sensors, domestic hot water and photovoltaic).





Figure 6: Office building with all features

Figures 7-9 show the following schedules: occupancy (Figure 7), lighting (Figure 8) and equipment (Figure 9).

\$ ********** SCHEDULE \$ *************	*******	*****	OCCUPANCY ********* **************************
OC-1	= DAY- <u>SCHEDULE</u>	(1,8) (0.0) (9,11) (1.0) (12,14) (0.8,0.4,0.8) (15,18) (1.0) (19,21) (0.5,0.1,0.1)	
OC-2 OC-WEEK OCCUPY-1	= DAY-SCHEDULE = WEEK-SCHEDULE = SCHEDULE	(1,24) (0.0) (1,24) (0.0) (WD) OC-1 (WEH) OC-2 THRU DEC 31 OC-WEEK	

Figure 7: Occupancy Schedule used for Houston and Denver

*********** z ********************* LIGHTING ****** SCHEDULE s ****** ******* (1<u>,8</u>) (0.05) T/T-1 =DAY-SCHEDULE (9,18) (1.0) \$OFFICE2 LIGHTING SCHEDULE HAS BEEN SET TO ONE DURING OFFICE HOURS. (19,24) (0.05).. LT-2 =DAY-SCHEDULE (1,24) (0.05) .. (MON, FRI) LT-1 (WEH) LT-2 .. LT-WEEK =WEEK-SCHEDULE THRU DEC 31 LT-WEEK =SCHEDULE LIGHTS-1

Figure 8: Lighting Schedule used for Houston and Denver



Figure 9: Equipment Schedule used for Houston and Denver

Figure 10 shows the space characteristics input for Houston and Denver. It shows the space, the occupancy, the equipment and the lighting characteristics for the solar office building. No infiltration was used for the simulation.

e							

s		SPACE1-1					
**********		*****					
\$							
*********		***** ******* *************************					

SPACE1-1	= SPACE						
ZONE-TYPE	= CONDITIONED	\$ DOE2 DEFAULTS					
AREA	= 5000						
VOLUME	= 70000						
x	= 0.0000						
Y	= 0.0000	5 DOEZ DEFAULTS					
2	= 10.0000	5 DOEZ DEFAULTS					
AZIMUTH	= 0.0000	5 DOE2 DEFAULTS					
MULTIPLIER	- 1.0000	S DUEZ DEFAULIS					
FLOOR-WEIGHT	= 70	\$ IECC 2001,402.1.3.3.0052 DEFAULTS 15 70					
NUMBER-OF-PEOPLE	= 50						
DEODIE-MENT_CAIN	= 0000P1-1	C DOP2 DPP3 III TR					
DEODIE_HC_INT	= 120 2	e DOP2 DEFAULTS					
DEODIF_HC_SENS	= 252 2	e DOP2 DEFAULTS					
FOUTP-SCHE DULE	= FOUTP-1	\$ DOLE DEROLID					
EQUIT PMENT-W/SOFT	= 1	\$ DOE2 DEFAULTS					
ATR-CHANGES/HR	= 0.25	S DOE2 DEFAILTS					
TEMPERATURE	= (73)	\$ DOE2 DEFAULTS					
SOURCE-TYPE	= ELECTRIC	\$ DOE2 DEFAULTS					
SOURCE-POWER	= 0.0000	\$ DOE2 DEFAULTS					
EQUIP-LATENT	= 0.0000	\$ DOE2 DEFAULTS					
EQUIP-SENSIBLE	= 1.0000	\$ DOE2 DEFAULTS					
SOURCE-LATENT	= 0.5	\$ DOE2 DEFAULTS					
SOURCE-SENSIBLE	= 0.4	\$ DOE2 DEFAULTS					
FLOOR-MULT IPLIER	= 1.0000	\$ DOE2 DEFAULTS					
LIGHTING-SCHEDULE	= LIGHTS-1						
LIGHTING-TYPE	= REC-FLUOR-R	V					
LIGHT-TO-SPACE	= 0.80						
LIGHTING-W/SOFT	= 1.5						
DAYLIGHTING	= YES	\$ DAYLIGHING OFTION IS SWITCHED ON					
LIGHT-REF-POINT1	= (25,25,2.2)	S LOCATION OF THE FIRST DAYLIGHT SENSOR					
LIGHT-REF-POINT2	= (75,25,2.2)	\$ LOCTION OF THE SECOND DAYLIGHT SENSOR					
ZONE-FRACTION1	0.5	5 FRACTION OF THE ZONE CONTROLLED BY SENSOR 1					
ZUNE-FRACTION2	- 0.5	S FRACTION OF THE ZONE CONTROLLED BY SENSOR Z					
LIGHI-SEI-POINII	- 50	S TARGET ILLUMINATION (FC) REQUIRED AT SENSOR 1					
LIGHI-SEI-POINIZ	- 30	S TARGET ILLUMINATION (FC) REQUIRED AT SEMBOR 2					
CONTROLLED BY SENSOR	- CONTRACTOR	S TIPE OF LIGHTING CONTROL FOR FORTRION OF ZONE AREA					
I TORT_OTDI _TVDP2		C TY DE OF I TONTING CONTROL FOR DODITRION OF 70MF 30F3					
CONTROLLED BY SENSOR	2	and the of Branning Control for Forthilds of Ball MER					
MIN-POWER-FRAC	= o	S LOWEST INPUT POWER FRACTION FOR CONTINUOUSLY DIMMABLE					
LIGHING CONTROL SYST	EM						
MIN-LIGHT-FRAC	= 0	\$ SPECIFIES THE FRACTIONAL LIGHT OUTPUT THAT A CONTINUOUSLY					
DIMMABLE							
		\$ LIGHTING CONTROL SYSTEM PRODUCES AT THE MINIMUM FRACTIONAL					
INPUT POWER GIVEN BY	MIN-POWER-FRA	c					

Figure 10: Space characteristics input in DOE-2.1e for Houston and Denver

Figure 11 and Figure 12 show the hourly reports section used to plot the variables (clearness number, dry bulb temperature, building heating load sensible, building heating load latent, building cooling load sensible, building cooling load latent and building electric total) used for Houston and Denver, respectively. The dry bulb temperature variable is processed in this section. The dry bulb temperature is used to calculate the heat loss that is input for the F-Chart.

```
$---HOURLY REPORTS---$
PLTSCH = SCHEDULE THRU JAN 14 (ALL) (1,24) (1)
                        THRU AUG 9 (ALL) (1,24) (1)
                       THRU DEC 31 (ALL) (1,24) (1)
PLOTER1 = REPORT-BLOCK
           VARIABLE-TYPE = GLOBAL
VARIABLE-LIST = (1, 4, 6) $ CLEARNESS NUMBER, DRY BULB
TEMPERATURE (°F), CLOUD AMOUNT (0 TO 10) FROM REFERENCE PT1 III.101
PLOTER2 = REPORT-BLOCK
           VARIABLE-TYPE = BUILDING
           VARIABLE-LIST = (1, 2, 19, 20, 37) $ BUILDING HEATING LOAD
(SENSIBLE), BUILDING HEATING LOAD (LATENT), BUILDING COOLING LOAD
(SENSIBLE), BUILDING COOLING LOAD (LATENT), BUILDING ELECTRIC TOTAL FROM
REFERENCE PT1 III.103 AND III.104
LDS-REP-1 = HOURLY-REPORT
             REPORT-SCHEDULE = PLTSCH
             REPORT-BLOCK = (PLOTER1, PLOTER2)
OPTION = PRINT
             OPTION
END ...
COMPUTE LOADS
```

Figure 11: Hourly reports calculation command lines in DOE-2.1e for Loads for Houston

```
$---HOURLY REPORTS---$
PLTSCH = SCHEDULE THRU FEB 3 (ALL) (1.24) (1)
                       THRU AUG 25 (ALL) (1,24) (1)
                       THRU DEC 31 (ALL) (1,24) (1)
PLOTER1 = REPORT-BLOCK
           VARIABLE-TYPE = GLOBAL
          VARIABLE-LIST = (1, 4, 6)
                                           .. $ CLEARNESS NUMBER, DRY BULB
TEMPERATURE (°F), CLOUD AMOUNT (0 TO 10) FROM REFERENCE PT1 III.101
PLOTER2 = REPORT-BLOCK
           VARIABLE-TYPE = BUILDING
          VARIABLE-LIST = (1, 2, 19, 20, 37) ... $ BUILDING HEATING LOAD
(SENSIBLE), BUILDING HEATING LOAD (LATENT), BUILDING COOLING LOAD (SENSIBLE), BUILDING COOLING LOAD (LATENT), BUILDING ELECTRIC TOTAL FROM
REFERENCE PT1 III.103 AND III.104
LDS-REP-1 = HOURLY-REPORT
             REPORT-SCHEDULE = PLTSCH
            REPORT-BLOCK = (PLOTER1, PLOTER2)
OPTION = PRINT ...
END ...
COMPUTE LOADS
                 . .
```

Figure 12: Hourly reports calculation command lines in DOE-2.1e for Loads for Denver

Figure 13 is the input systems section for the system schedules for the fans, the heating, the cooling and the ventilation simulated for Houston and Denver. The SS-A report for total heating energy is processed in this section. The total heating energy is used to calculate the heat loss that is input for the F-Chart.

INPUT SYSTEMS	INPUT-UNITS = OUTPUT-UNITS	= ENGLISH \$DOE-2 DEFAULT (OR METRIC) = ENGLISH \$DOE-2 DEFAULT (OR METRIC)	
	SYSTEMS-REPOR	ISUMMARY = (ALL-SUMMARY) VERIFICATION = (SV-A) REPORT-FREQUENCY = HOURLY HOURLY-DATA-SAVE = NO- <u>SAVE</u>	
	\$ SYSTEMS SCHI	EDULES	
FAN-1 FAN-2 FAN-SCHED	=DAY-SCHEDULE =DAY-SCHEDULE =SCHEDULE	(1,24) (1) (1,24) (1) THRU DEC 31 (WD) FAN-1 (WEH) FAN-2	
HEAT-1 =D. HEAT-2 =D. HEAT-WEEK =W. HEAT- <u>SCHED</u> =S COOLOFF =S HEATOFF =S	AY-SCHEDULE AY-SCHEDULE EEK-SCHEDULE CHEDULE CHEDULE CHEDULE	(1,24) (68) (1,24) (68) (MON,ERI) HEAT-1 (WEH) HEAT-2 THRU DEC 31 (ALL) (1,24) (1) THRU DEC 31 (ALL) (1,24) (1)	
COOL-1 =D. COOL-2 =D. COOL-WEEK =W. COOL- <u>SCHED</u> S	AY-SCHEDULE AY-SCHEDULE EEK-SCHEDULE CHEDULE	(1,24) (78) (1,24) (78) (MON,ERI) COOL-1 (WEH) COOL-2 THRU DEC 31 COOL-WEEK	
VENT-1 =D. VENT-2 =D. VENT-WEEK =W. VENT-SCH =S	AY-SCHEDULE AY-SCHEDULE EEK-SCHEDULE CHEDULE	(1,24) (1) (1,24) (1) (MON,FRI) VENT-1 (WEH) VENT-2 THRU DEC 31 VENT-WERK	
R1 =D. SAT-RESET =R	AY-RESET-SCH ESET-SCHEDULE	SUPPLY-HI=60 SUPPLY-LO=52 OUTSIDE-LO=30 OUTSIDE-HI=75 THRU DEC 31 (ALL) R1	

Figure 13: Input Systems for Loads in DOE-2.1e for Houston and Denver

Figure 14 is a section of the description of the System Input used for the solar office building for Houston and Denver. The System-Type=VAVS is the system assigned to the office building. The System-Type=SUM is the system assigned to simulate the building heating and cooling loads considering the thermostat set-points without simulating the system (i.e., VAVS for this building). This will provide heating loads excluding the impacts of the efficiency and part-load performance of the heating system. Figure 15 is the section of the Systems Input where the DHW is assigned for the solar office building for Houston and Denver. The following elements are contained in this section: DHW-Type=Electric, a schedule and the number of gallons that are required from ASHRAE 90.1 User's Manual for the 50 people in the office. Figure 16 shows the section of the Plant Input where the PS-E report is produced for the final graphs.

	§ SYSTE	DESCRIPTION
ZAIR	-ZONE-AIR	OR-CFM/ PER-Q
CONTROL	-ZONE-CONTROL. \$ FOLD \$ DIV:	.DESIGN-HEAT-T-70 DESIGN-COOL-T-76 HEAT-TEMF-SCH HEAT-SCHED COOL-TEMF-SCH -OOL-SCHED THERMOSTAT-TYPE-REVERSE- <u>&CTION</u> LOWING AIR FLOWS ARE FROM RUN 3 SV-A REPORT, IDED BY ALTITUDE MULTIPLIER
SPACE1-1	-IONE	ZONE-AIR-ZAIRSIZING-OPTION-ADJUST-LOADS ZONE-CONTROL - CONTROL ZONE-CONTROL - CONDITIONED TROM-VENT-SCH - VENT-SCH BASEBOARD-BAIING
S-CONT	-SYSTEM-CONTROL	COLPETTING-SCHEDULE- COOLOFF HEATING-SCHEDULE- HEATOFF HEAT-SET-T-65 COOL-CONTROL-RESET COOL-RESET-SCH-SAT-RESET MIN-SUFPLY-T-60
S-FAN	-SYSTEM- FANS	FAN-SCHEDULE-FAN-SCHED.FAN-CONTROL-SPEED SUPPLY-STATIC-2.0SUPPLY-EFF55 NIGHT-CYCLE-CTRL-CYCLE-ON-ANX
S-TERM	-SYSTEM-TERMIN	AL REHEAT-DELTA-T-58 MIN-CFM-RATIO-Quinton
SYST-1	-SYSTEM	SYSTEM-TYPE-VAV3 SUPPLY-CFM - 7366 SYSTEM-CONTROL - S-CONT SYSTEM-FANS - S-FAN SYSTEM-TERMINAL - S-TERM ECONO-LIMIT-T - 65 ZONE-NAMES - (SPACE1-1) HEAT-SOURCE - ELECTRIC PARHEAT-SOURCE - ELECTRIC VARIABLE-T - ON SIZING-RATIO - 1.00 % DOE-2.1 DEFAULT HEAT-SIZING-RAZIO1.00 % DOE-2.1 DEFAULT

Figure 14: System Input in DOE-2.1e for Houston and Denver



Figure 15: Plant Assignment Input for DHW in DOE-2.1e for Houston and Denver



Figure 16: Plant Input in DOE-2.1e for Houston and Denver

3.3 Analysis through Inverse Model Toolkit (IMT)

Table 6 shows the total monthly heating energy from the SS-A report and the average monthly dry bulb temperature from the Loads Report from the files (01A1a_19H for Houston and 01A2a_19D for Denver). These results were obtained using system SUM in DOE-2.1e and were input to the IMT.

Table 6: Total Heating energy (SS-A report) and Dry Bulb temperature (Loads report) result								
Table 0. Total ficalities cheres (55-A report) and Div Duib temperature (Loaus report) result	Tabla 6.	Total Hasting anargy	(SS A ror	ort) and Dry	2 Rulh tom	noratura (I and rat	nort) recult
		Total ficating chergy	IDD-AICL	JUIL) and DI	y Duit tem		LUaus IE	DOIL) IESUIL

	Houston		Denver		
Months	Heating	Temperature	Heating	Temperature	
Jan	781,161	53.4	5,045,419	30.2	
Feb	305,806	51.6	3,896,516	33	
Mar	0	61.2	1,710,968	38.4	
Apr	0	68.9	548,903	48.6	
May	0	75.1	34,839	56.4	
Jun	0	79.8	0	65	
Jul	0	82.4	0	73.5	
Aug	0	81.1	0	70.1	
Sep	0	77.5	0	62.4	
Oct	0	69.7	63,484	51.4	
Nov	0	62.8	1,350,194	38.2	
Dec	227,613	52.6	4,996,645	29.1	

Figure 17 presents the monthly heating energy consumption for Houston. There are clearly three lines in the graph: a line that represents the heating energy consumption between January and March; a horizontal line that represents low heating energy consumption between March and November and the last line that represents the heating energy consumption from November to December. The units used were Btu/hr. Figure 18 presents the monthly heating energy consumption for Denver. There are three lines in the graph: a line that represents the heating energy consumption between January and May; a horizontal line that represents low heating

energy consumption between May and October and the last line that represents the heating energy consumption from October to December. The units used were Btu/hr.







Figure 18: Monthly total heating energy consumption from SS-A report for Denver

The data was input in the Daily2.dat file (Figure 19 and Figure 20). The 1st column is the file type, the 2nd column is the month, the 3rd column is the year, the 4th column indicates the residual file, the 5th column is the cooling energy, the 6th column is the heating energy, the 7th column is the electricity, and the 8th column is the dry bulb temperature.

. 🛄 C	AILY2 ·	- Notepad								• X
File	Edit	Format View	Help							
Ī		114 114 114 114 114 114 114 114 114 114	1 2 3 4 5 6 7 8 9 10 11 12	10 10 10 10 10 10 10 10 10 10	1 1 1 1 1 1 1 1 1	3723151.000 2702415.000 6460924.000 8988163.000 12088715.000 15242733.000 17047270.000 16265071.000 15039337.000 12186867.000 8451499.000 3221938.000	781161.000 305806.429 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 227613.000	2118.000 1708.000 1765.000 1535.000 1449.000 1403.000 1448.000 1369.000 1445.000 1486.000 1639.000 2095.000	53.400 51.600 61.200 68.900 75.100 79.800 82.400 81.100 77.500 69.700 62.800 52.600	*
										► H

Figure 19: IMT file used for Houston

DAILY2	- Notepad								• ×
File Edit	Format View	Help							
	114 114 114 114 114 114 114 114 114 114	1 2 3 4 5 6 7 8 9 10 11 12	10 10 10 10 10 10 10 10 10 10	1 1 1 1 1 1 1 1	377985.000 921190.000 928901.000 2485045.000 4445388.000 8516547.000 13352385.000 12473884.000 9521117.000 5724945.000 1118965.000 218168.000	5045419.000 3896516.000 1710968.000 548903.000 34839.000 0.000 0.000 0.000 63484.000 1350194.000 4996645.000	3546.000 2924.000 2221.000 1613.000 1374.000 1468.000 1438.000 1438.000 1441.000 1341.000 1484.000 2228.000 3660.000	30.200 33.000 38.400 48.600 56.400 65.000 73.500 70.100 62.400 51.400 38.200 29.100	~

Figure 20: IMT file used for Denver

Figure 21 shows the parameters used to run the simulation in the IMT. Some parameters were changed in the Daily2ins.txt (Figure21) such as the Model type=4 (this means a 3 point heating type simulation), the "y" variable is the heating energy and the "x" variable is the dry bulb temperature. The model type ran for the two cities were the 4: 3ph (Three point heating). The 6^{th} column number is the dependent "y" variable is the one that corresponds to the heating energy from the SS-A report from DOE-2.1e. The 8th column is the independent variable $X_1 = 8$ is the one that corresponds to the average monthly dry bulb temperature from the Loads report.

Figure 21: Parameters changed to run the simulation for Houston and Denver

The Daily2ins.txt file is ran in IMT and the Building UA number is equal to the LS line in Figure 22 (left) for Houston and (right) for Denver. These two numbers are input to the F-Chart files to calculate the DHW for the solar office building.

IMT - Notepad	IMT - Notepad
File Edit Format View Help	File Edit Format View Help
ASHRAE INVERSE MODELING TOOLKIT (1.9)	ASHKAE INVERSE MODELING TOOLKIT (1.9)
output Tile name = IMT.Out ************************************	Output Tile name = IMT.Out ************************************
<pre># of X(Indep.) Var = 1 Y1 column number = 6 X1 column number = 8 X2 column number = 0 (unused) X3 column number = 0 (unused) X4 column number = 0 (unused) X5 column number = 0 (unused) X6 column number = 0 (unused) X8 column number = 0 (unused)</pre>	<pre># of X(Indep.) Var = 1 Y1 column number = 6 X1 column number = 8 X2 column number = 0 (unused) X3 column number = 0 (unused) X4 column number = 0 (unused) X5 column number = 0 (unused) X6 column number = 0 (unused) ************************************</pre>
N = 12	N = 12
R2 = 0.639	R2 = 0.988
AdjR2 = 0.639	AdjR2 = 0.988
RMSE = 148561.0781	RMSE = 229507.6719
CV-RMSE = 135.612%	CV-RMSE = 15.607%
p = -0.820	p = 0.386
DW = 1.589 (p>0)	DW = 1.092 (p>0)
N1 = 4	N1 = 5
N2 = 8	N2 = 7
Ycp = -663.9735 (50250.8203)	Ycp = 74819.4688 (81926.3828)
L5 = -41391.7383 (9836.2197)	LS =-387711.3750 (13386.6143)
RS = 0.0000 (0.0000)	R5 = 0.0000 (0.0000)
xcp = 62.6880 (0.6160)	xcp = 42.4200 (0.8880)

Figure 22: IMT final result for Houston (left) and Denver (right)

3.4 Analysis through F-Chart

The F-Chart software was used to simulate the Domestic Hot Water (DHW) of the office building. The following parameters were used: the building geometry, area, people, tank size, data from DOE-2.1e, the IMT result, the chosen active storage system and flat-plate collector characteristics to simulate the DHW into F-Chart for Houston and Denver. Table 7 and Table 8 present these parameters.

Element	Amount	Units
Floors	1	
Large side (floor plan)	100	ft²
Width side (floor plan)	50	ft²
Area of floor plan	5,000	ft²
Total Area of building	5,000	ft²
People	50	
Tank size	50	gal
Domestic Hot Water requirements	1	gal/day/person
Location	Houston	
Building UA	30,887	Btu/hr-°F
Building Storage Capacity	30,000	Btu/°F
Low Thermostat Set Temperature	68	٥F
Daily Internal Generation	0.1	Btu/day
Allowable Temperature Swing	10	٥F
Fuel	Electricity	
Efficiency of fuel usage	100	%
Duct losses	No	
Domestic hot water	Yes	
Daily hot water usage	100	gal
Water set temperature	140	٥F
Environmental temperature	68	٥F
UA of auxiliary storage tank	7.6	Btu/hr-°F
Heat Exchanger Water Flowrate	2,000	lb/hr.
Air-Water Heat Exch. Effectiveness	0.5	
Number of collector panels	3	
Collector panel area	32	ft²
FR*UL (Test slope)	0.74	Btu/hr-ft ² -°F
FR*Tau*ALPHA(Test intercept)	0.7	
Collector slope	18	° (Degrees)
Collector azimuth (South=0)	0	° (Degrees)
Incidence angle modifier calculation	Glazings	
Number of glass covers	1	
Collector flowrate/area	11.06	lb/hr-ft²
Collector fluid specific heat	1	Btu/lb-°F
Modify test values	No	

Table 7: Parameters input to F-Chart for Houston

Element	Amount	Units
Floors	1	
Large side (floor plan)	100	ft²
Width side (floor plan)	50	ft²
Area of floor plan	5,000	ft²
Total Area of building	5,000	ft²
People	50	
Tank size	50	gal
Domestic Hot Water requirements	1	gal/day/person
Location	Denver	
Building UA	30,887	Btu/hr-°F
Building Storage Capacity	30,000	Btu/°F
Low Thermostat Set Temperature	68	٥F
Daily Internal Generation	0.1	Btu/day
Allowable Temperature Swing	10	°F
Fuel	Electricity	
Efficiency of fuel usage	100	%
Duct losses	No	
Domestic hot water	Yes	
Daily hot water usage	100	gal
Water set temperature	140	°F
Environmental temperature	68	٥F
UA of auxiliary storage tank	7.6	Btu/hr-°F
Heat Exchanger Water Flowrate	2,000	lb/hr.
Air-Water Heat Exch. Effectiveness	0.5	
Number of collector panels	3	
Collector panel area	32	ft²
FR*UL (Test slope)	0.74	Btu/hr-ft ² -°F
FR*Tau*ALPHA(Test intercept)	0.7	
Collector slope	18	° (Degrees)
Collector azimuth (South=0)	0	° (Degrees)
Incidence angle modifier calculation	Glazings	
Number of glass covers	1	
Collector flowrate/area	11.06	lb/hr-ft²
Collector fluid specific heat	1	Btu/lb-°F
Modify test values	No	

Table 8: Parameters input to F-Chart for Denver
Figure 23 and Figure 24 show the results for the DHW for Houston and Denver, respectively. The output has monthly results in MMBtu for the following elements: 1) "Solar" is the total solar radiation incidence on the flat-plate collector surface, 2) "*Heat*" is the total space heating demand, 3) "*Dhw*" is the total water heating demand, 4) "*Aux*" is the total auxiliary energy that is required to supply the space and domestic hot water demands and 5) "f" is the fraction of the space and domestic hot water demands that is supplied by the flat-plate collector. The "*Dhw*" and the "*Aux*" columns will be used for the final graph.

🚷 Therma	l Output					- • •
	Solar [10 ⁶ Btu]	Heat [10 ⁶ Btu]	Dhw [10 ⁶ Btu]	Aux [10 ⁶ Btu]	f []	
Jan	3.245	529.8	2.360	530.4	0.003	
Feb	3.178	367.5	2.118	367.8	0.005	
Mar	4.326	233.1	2.272	232.8	0.011	
Apr	4.567	64.7	2.080	64.7	0.032	
May	4.993	12.7	2.014	12.2	0.170	
Jun	5.189	0.0	1.847	0.3	0.813	
Jul	5.613	0.0	1.834	0.3	0.853	
Aug	5.160	0.0	1.845	0.4	0.798	
Sep	4.893	0.0	1.861	0.4	0.774	
Oct	4.577	72.6	2.045	72.5	0.029	
Nov	3.519	184.7	2.111	184.7	0.011	
Dec	3.035	420.4	2.282	421.1	0.004	
Year	52.294	1885.6	24.669	1887.7	0.012	

Figure 23: Final results from F-Chart for Housto

🔞 Therma	al Output					
	Solar [10 ⁶ Btu]	Heat [10 ⁶ Btu]	Dh w [10 ⁶ Btu]	Aux [10 ⁶ Btu]	f []	
Jan	3.310	9981	2.753	9982	0.000	
Feb	3.376	9408	2.506	9409	0.000	
Mar	5.050	7222	2.740	7222	0.000	
Apr	4.606	7137	2.566	7137	0.000	
May	5.998	2571	2.534	2570	0.001	
Jun	6.527	252	2.350	252	0.010	
Jul	6.300	384	2.327	384	0.007	
Aug	5.872	333	2.302	333	0.007	
Sep	5.282	1073	2.263	1072	0.003	
Oct	4.262	5217	2.428	5217	0.000	
Nov	2.996	8600	2.463	8601	0.000	
Dec	2.770	9646	2.647	9647	0.000	
Year	56.349	61825	29.879	61828	0.000	

Figure 24: Final results from F-Chart for Denver

3.5 Analysis through PV F-Chart

The PV F-Chart software was used to simulate photovoltaic. The following parameters were used: the building geometry, area, people, tank size, data from DOE-2.1e, chosen flat-plate array characteristics to simulate the photovoltaic into PV F-Chart for Houston and Denver. Table 9 and Table 10 present these parameters. The array slope for the PV was originally the same slope

of the southern roof of the building (18°). A second option is added when the array slope was changed to 30° for Houston and 40° for Denver.

Element	Amount	Units
Floors	1	
Large side (floor plan)	100	ft²
Width side (floor plan)	50	ft²
Area of floor plan	5,000	ft²
Total Area of building	5,000	ft²
City	Houston	
Cell Temperature (NOCT conditions)	0.5	°F
Array reference efficiency	0.15	
Array reference temperature	82.4	°F
Array temperature coefficient*1000	2.389	1/°F
Power tracking efficiency	0.9	
Power conditioning efficiency	0.88	
% Standard deviation of load	0	%
Array area (no. of panels X panel area)	96	ft ²
Array slope	18/30	° (Degrees)
Array azimuth (South=0)	0	° (Degrees)

Table 9: Parameters input to PV F-Chart for Houston

Table 10: Parameters input to PV F-Chart for Denver

Element	Amount	Units
Floors	1	
Large side (floor plan)	100	ft²
Width side (floor plan)	50	ft²
Area of floor plan	5,000	ft²
Total Area of building	5,000	ft²
City	Boulder	
Cell Temperature (NOCT conditions)	0.5	°F
Array reference efficiency	0.15	
Array reference temperature	82.4	°F
Array temperature coefficient*1000	2.389	1/°F
Power tracking efficiency	0.9	
Power conditioning efficiency	0.88	
% Standard deviation of load	0	%
Array area (no. of panels X panel area)	96	ft²
Array slope	18/40	° (Degrees)
Array azimuth (South=0)	0	° (Degrees)

Figure 25 and Figure 26 show the results for the on-site solar electric energy generated for Houston, while Figure 27 and Figure 28 show the results for the on-site solar electric energy generated for Denver. The output has monthly results in kW-hrs. ("*Solar*", "*Load*, "*Excess and*" "*Buy*") and *percentage* ("*Efficiency*" and "f") for the following elements:

- 1) "Solar" is the total solar radiation incidence on the flat-plate array surface,
- 2) *"Efficiency"* is the percent of the solar radiation incident on the flat-late array that is convert to electrical energy,
- 3) "Load" is the total electrical demand on the system,
- 4) 4) f is the percent of the load supplied directly by the flat-plate array,
- 5) 5) "Excess" is the total electrical energy that is dissipated from the system and
- 6) 6) "*Buy*" is the total electrical energy that should be purchased from the utility to complement the load.

The "Dhw" column will be used for the final results graph.

ımmary Jan	Feb Ma	r Apr Ma	y ∣Jun ∣Jul	Aug Sep) Oct Nov	Dec
	Solar [k₩-hrs]	Efficiency [%]	Load [kW-hrs]	f [%]	Excess [k₩-hrs]	Buy [k₩-hrs]
Jan	20076.8	14.73	0.0	100.0	2601.9	0.0
Feb	22186.9	14.79	0.0	100.0	2886.8	0.0
Mar 28816.8		14.70	0.0	100.0	3726.5	0.0
Apr 31227.8		14.53	0.0	100.0	3992.4	0.0
May	34642.0	14.33	0.0	100.0	4367.1	0.0
Jun	35273.2	14.17	0.0	100.0	4397.1	0.0
Jul	36311.1	14.13	0.0	100.0	4514.7	0.0
Aug	35437.2	14.20	0.0	100.0	4427.7	0.0
Sep	31508.2	14.29	0.0	100.0	3963.5	0.0
Oct 30130.3		14.50	0.0	100.0	3843.3	0.0
Nov 22365.8		14.55	0.0	100.0	2864.6	0.0
Dec 19155.2		14.57	0.0	100.0	2456.0	0.0

Figure 25: Final results from PV F-Chart for Houston (Array slope = 18°)

mmary Jan	Feb Ma	r Apr Ma	y ∣Jun ∣Jul	Aug Sep) Oct Nov	/ Dec	
	Solar [k₩-hrs]	Efficiency [%]	Load [kW-hrs]	f [%]	Excess [kW-hrs]	Buy [k₩-hrs	
Jan	21483.6	15.03	0.0	100.0	2841.1	0.0	
Feb	23203.7	14.96	0.0	100.0	3054.6	0.0	
Mar	29031.2	14.76	0.0	100.0	3769.7	0.0	
Apr 30423.6		14.49	0.0	100.0	3878.2	0.0	
May 32745.3		14.19	0.0	100.0	4088.0	0.0	
Jun	32898.6	13.98	0.0	100.0	4047.9	0.0	
Jul	34080.6	13.97	0.0	100.0	4188.6	0.0	
Aug	34105.1	14.12	0.0	100.0	4236.3	0.0	
Sep	31405.5	14.32	0.0	100.0	3957.5	0.0	
Oct	31401.6	14.64	0.0	100.0	4045.6	0.0	
Nov 23894.9		14.84	0.0	100.0	3119.9	0.0	
Dec 20661.0		14.90	0.0	100.0	2709.4	0.0	

Figure 26: Final results from PV F-Chart for Houston (Array slope = 30°)

immary Jan	Feb Mar	Apr May	v ∣Jun ∣Jul	Aug Sep) Oct Nov	Dec
	Solar [kW-hrs]	Efficiency [%]	Load [k₩-hrs]	f [%]	Excess [k₩-hrs]	Buy [kW-hrs
Jan	21252.1	15.06	0.0	100.0	2815.8	0.0
Feb	23620.6	15.33	0.0	100.0	3187.2	0.0
Mar	31986.9	15.38	0.0	100.0	4328.2	0.0
Apr	36255.5	15.25	0.0	100.0	4864.4	0.0
May	39510.2	14.97	0.0	100.0	5205.5	0.0
Jun	41513.6	14.70	0.0	100.0	5368.8	0.0
Jul	42381.7	14.53	0.0	100.0	5417.7	0.0
Aug	39437.9	14.59	0.0	100.0	5064.6	0.0
Sep	34151.7	14.76	0.0	100.0	4436.6	0.0
Oct	29639.3	14.96	0.0	100.0	3901.9	0.0
Nov	21910.9	14.89	0.0	100.0	2871.7	0.0
Dec	19542.4	14.91	0.0	100.0	2563.9	0.0

Figure 27: Final results from PV F-Chart for Denver (Array slope = 18°)

immary Jan	Feb Ma	r Apr Ma	y Jun Jul	Aug Sep	Oct Nov	Dec
	Solar [kW-hrs]	Efficiency [%]	Load [kW-hrs]	f [%]	Excess [kW-hrs]	Buy [k₩-hrs]
Jan	26435.9	15.97	0.0	100.0	3715.6	0.0
Feb	27183.3	15.92	0.0	100.0	3808.8	0.0
Mar	33818.6	15.61	0.0	100.0	4646.9	0.0
Apr	35519.2	15.25	0.0	100.0	4767.6	0.0
May 36301.5		14.79	0.0	100.0	4723.4	0.0
Jun	37098.9	14.45	0.0	100.0	4717.6	0.0
Jul	38396.0	14.31	0.0	100.0	4835.6	0.0
Aug	37650.0	14.52	0.0	100.0	4810.5	0.0
Sep	35156.9	14.91	0.0	100.0	4614.1	0.0
Oct	33476.1	15.44	0.0	100.0	4547.0	0.0
Nov 26695.2		15.72	0.0	100.0	3692.9	0.0
Dec	24813.4	15.89	0.0	100.0	3470.4	0.0

Figure 28: Final results from PV F-Chart for Denver (Array slope = 40°)

3.6 Analysis through Revit BIM Model

This current BIM-Model will be used later for later phases of the research process. The BIM-Model of the complex building was generated for Houston and Denver after creating the model into DOE-2.1e. The days of the renderings correspond to the design days used in DOE-2.1e for summer and winter. The days chosen were: August 9th (summer) and January 14th (winter) for Houston, and August 25th (summer) and February 3rd (winter) for Denver. The building shows the different features from the DOE-2.1e Model: Trombé wall (that was finally removed from the DOE-2.1e Model, because of the low energy-efficiency results), south windows, clerestory and photovoltaic. This BIM-Model is still in process.

4 WHOLE BUILDING SIMULATION ANALYSES

This section shows the graphs with the final monthly results from the DOE-2.1e, F-Chart and PV F-Chart simulations for the office building in Houston and Denver. Table 11 and Table 12 show the results for Houston, while Table 13and Table 14 show the results for Denver. The PV array slope in Tables 11 and 13 is 18° for both Houston and Denver. The slope of the PV array matches the slope of the southern roof. Table 12 uses the PV array slope of 30° for Houston, and Table 14 uses PV array slope of 40° for Denver. The following results are taken from the PS-E report from DOE-2.1e and used in the Tables 11, 12, 13 and 14: *"Lighting", "Equipment", "Heating", "Cooling", "Pumps & Misc.", "Vent. Fans" and "DHW"*. The *"Thermal Load (Heating + DHW)"* column is the sum of the *"Lighting", "Equipment", "Cooling", and "Vent. Fans"* columns. The *"Total"* column is the sum of the *"Lighting", "Equipment", "Cooling", and "Vent. Fans"* columns. The *"Total"* column is the sum of the *"Lighting", "Equipment", "Cooling", "Pumps & Misc." and "Vent. Fans"* column is the sum of the *"Lighting", "Equipment", "Cooling", "Pumps & Misc." and "Vent. Fans"* columns. The *"Total"* column is the sum of the *"Lighting", "Equipment", "Cooling", "Pumps & Misc." and "Vent. Fans"* columns. The *"Total"* column is the sum of the *"Thermal Load (Heating + DHW)"* and the *"Electric only (No Heating + No DHW)"* columns. The *"Total"* column is the sum of the *"Thermal Load (Heating + DHW)"* and the *"Electric only (No Heating + No DHW)"* columns. This last column has the total monthly energy consumption of the office building simulated through DOE-2.1e.

The last three columns of the table are the following: "Energy Available from Collector", "Energy Available from PV" and "Total Energy Available". The first column is the solar thermal energy simulated through the F-Chart. The second column is the solar electric energy simulated through the PV F-Chart. The final column is the sum of the previous two columns and represents the total monthly on-site energy produced through solar collectors and photovoltaic. Figures 29 to 36 show the graphs with the data from Tables 11 to 14. Each month has two stack columns. The left column has the following data: "Lighting", "Equipment", "Heating", "Cooling", "Pumps & Misc.", "Vent. Fans" and "DHW". The right column has the following data: "Energy Available from Collector" and "Energy Available from PV".

Figures 29 and 31 show the graphs with the results for Houston. Figure 29 shows a big on-site energy produced during the summer months compared to the January-February and November-December periods. Houston is located at 30°N and this angle is commonly used for solar and energy calculation purposes. If the PV array slope is changed from 18° to 30°, the on-site energy results will change. Figure 31 shows a reduction of on-site energy produced during the summer months and an increase of on-site energy produced during the January-February and November-December periods. The energy consumed in the office building in Houston is high in January, February, the summer months, September, October and December. Figures 33 and 35 show the graphs with the results for Denver. Figure 33 shows that a big on-site energy was produced in the March-September period compared to January, November and December. Denver is located at 40°N and this angle is commonly used for solar and energy calculation purposes. If the PV array slope is changed from 18° to 40°, like it was done for Houston, the on-site energy results will change. Figure 35 shows a reduction of on-site energy produced during March-September period and an increase of on-site energy produced during the January-February and November-December periods. The energy consumed in the office building in Denver is high in January, February, March, November and December.

Figures 30 and 32 show the graphs with the annual results for Houston. Figure 30 shows the energy consumed in the office building in the first column. The second column is the result of

the F-Chart and the PV F-Chart programs for the harvested on-site energy from the use of the Domestic Hot Water, and the 18° slope of the Photovoltaic Array, respectively. The final result shows that there is an excess of 2 percent of harvested on-site energy over the consumed energy of the office building. Figure 32 shows the energy consumed in the office building in the first column. The second column is the result of the F-Chart and the PV F-Chart programs for the harvested on-site energy from the use of the Domestic Hot Water, and the 30° slope of the Photovoltaic Array, respectively. The final result shows that there is an excess of 1 percent of harvested on-site energy over the consumed energy of the office building.

Figures 34 and 36 show the graphs with the annual results for Denver. Figure 34 shows the energy consumed in the office building in the first column. The second column is the result of the F-Chart and the PV F-Chart programs for the harvested on-site energy from the use of the Domestic Hot Water, and the 18° slope of the Photovoltaic Array, respectively. The final result shows that there is an excess of 2.5 percent of harvested on-site energy over the consumed energy of the office building. Figure 36 shows the energy consumed in the office building in the first column. The second column is the result of the F-Chart and the PV F-Chart programs for the harvested on-site energy from the use of the Photovoltaic Array, respectively. The final result of the F-Chart and the 40° slope of the Photovoltaic Array, respectively. The final result shows that there is an excess of 6.5 percent of harvested on-site energy over the consumed on-site energy over the consumed energy of the office building.

-													
												PV F-	
			Ene	rgy Neede	ed (from F	PS-E, DOE-2	.1e outpu	t)			F-Chart	Chart	
								Thermal	Electric		Energy		
					Pump.			Load	Only (No		Available	Energy	Total
					&	Vent.		(Heating +	Heating +		from	Available	Energy
	Lighting	Equipment	Heating	Cooling	Misc.	Fans	DHW	DHW)	No DHW)	TOTAL	Collector	from PV	Available
	kWh	kWh	kWh	kWh	kWh	kWh	kWh	kWh	kWh	kWh	kWh	kWh	kWh
Jan	734	1,088	892	1,021	186	233	421	1,313	3,262	4,575	691	2,602	3,293
Feb	593	999	910	874	168	213	392	1,302	2,847	4,149	621	2,887	3,507
Mar	626	1,140	69	1,193	186	235	435	504	3,380	3 <i>,</i> 884	666	3,727	4,392
Apr	437	1,098	0	1,426	180	228	415	415	3,369	3,784	609	3,992	4,602
May	361	1,088	0	1,801	186	239	405	405	3 <i>,</i> 675	4,080	590	4,367	4,957
Jun	305	1,098	0	2,185	180	244	368	368	4,012	4,380	541	4,397	4,938
Jul	343	1,105	0	2,427	186	259	360	360	4,320	4,680	537	4,515	5,052
Aug	246	1,122	0	2,338	186	259	346	346	4,151	4,497	541	4,428	4,968
Sep	364	1,081	0	2,093	180	251	334	334	3,969	4,303	545	3,964	4,509
Oct	398	1,088	0	1,742	186	247	356	356	3,661	4,017	599	3 <i>,</i> 843	4,442
Nov	575	1,064	16	1,329	180	229	364	380	3,377	3 <i>,</i> 757	619	2,865	3,483
Dec	903	1,105	593	964	186	233	400	993	3,391	4,384	669	2,456	3,125
Year	5,886	13,077	2,480	19,391	2,184	2,869	4,597	7,077	43,407	50,484	7,228	44,042	51,270

Table 11: Final Energy Consumption results for the Solar Office Building in Houston (PV Solar Array slope = 18°)



Figure 29: Final Energy Consumption results for the Solar Office Building in Houston (PV Solar Array slope = 18°)



Figure 30: Final Total Annual Energy Consumption results for the Solar Office Building in Houston (PV Solar Array slope = 18°)

												PV F-	
			Ene	rgy Neede	d (from PS-	E, DOE-2.1e	output)				F-Chart	Chart	
								Thermal	Electric		Energy		
								Load	Only (No		Available	Energy	Total
					Pump. &	Vent.		(Heating	Heating +		from	Available	Energy
	Lighting	Equipment	Heating	Cooling	Misc.	Fans	DHW	+ DHW)	No DHW)	TOTAL	Collector	from PV	Available
	kWh	kWh	kWh	kWh	kWh	kWh	kWh	kWh	kWh	kWh	kWh	kWh	kWh
Jan	734	1,088	892	1,021	186	233	421	1,313	3,262	4,575	691	2,841	3,533
Feb	593	999	910	874	168	213	392	1,302	2,847	4,149	621	3 <i>,</i> 055	3,675
Mar	626	1,140	69	1,193	186	235	435	504	3,380	3,884	666	3,770	4,435
Apr	437	1,098	0	1,426	180	228	415	415	3,369	3,784	609	3 <i>,</i> 878	4,488
May	361	1,088	0	1,801	186	239	405	405	3,675	4,080	590	4,088	4,678
Jun	305	1,098	0	2,185	180	244	368	368	4,012	4,380	541	4,048	4,589
Jul	343	1,105	0	2,427	186	259	360	360	4,320	4,680	537	4,189	4,726
Aug	246	1,122	0	2,338	186	259	346	346	4,151	4,497	541	4,236	4,777
Sep	364	1,081	0	2,093	180	251	334	334	3,969	4,303	545	3,958	4,503
Oct	398	1,088	0	1,742	186	247	356	356	3,661	4,017	599	4,046	4,645
Nov	575	1,064	16	1,329	180	229	364	380	3,377	3,757	619	3,120	3,738
Dec	903	1,105	593	964	186	233	400	993	3,391	4,384	669	2,709	3,378
Year	5,886	13,077	2,480	19,391	2,184	2,869	4,597	7,077	43,407	50,484	7,228	43,937	51,165

Table 12: Final Energy Consumption results for the Solar Office Building in Houston (PV Solar Array slope = 30°)



Figure 31: Final Energy Consumption results for the Solar Office Building in Houston (PV Solar Array slope = 30°)



Figure 32: Final Total Annual Energy Consumption Results for the Solar Office Building in Houston (PV Solar Array Slope = 30°)

												PV F-	
			Ene	rgy Neede	ed (from PS-	E, DOE-2.1	e output)				F-Chart	Chart	
								Thermal	Electric		Energy		
								Load	Only (No		Available	Energy	Total
					Pump. &	Vent.		(Heating	Heating +		from	Available	Energy
	Lighting	Equipment	Heating	Cooling	Misc.	Fans	DHW	+ DHW)	No DHW)	TOTAL	Collector	from PV	Available
	kWh	kWh	kWh	kWh	kWh	kWh	kWh	kWh	kWh	kWh	kWh	kWh	kWh
Jan	548	1,088	3,396	784	196	233	535	3,931	2,849	6,780	807	2,816	3,622
Feb	450	999	2,778	750	177	211	499	3,277	2,587	5,864	734	3,187	3,921
Mar	433	1,140	1,886	828	196	233	554	2,440	2,830	5,270	803	4,328	5,131
Apr	307	1,098	855	873	189	226	528	1,383	2,693	4,076	752	4,864	5,616
May	272	1,088	395	1,041	196	233	511	906	2,830	3,736	742	5,206	5,948
Jun	369	1,098	23	1,331	189	227	460	483	3,214	3,697	689	5,369	6,057
Jul	333	1,105	0	1,904	196	245	445	445	3,783	4,228	682	5,418	6,100
Aug	287	1,122	0	1,760	196	247	426	426	3,612	4,038	674	5,065	5,739
Sep	260	1,081	56	1,428	189	233	411	467	3,191	3,658	663	4,437	5,100
Oct	372	1,088	372	1,125	196	238	440	812	3,019	3,831	711	3,902	4,613
Nov	653	1,064	1,709	808	189	226	454	2,163	2,940	5,103	722	2,872	3,593
Dec	664	1,105	3,552	792	196	233	504	4,056	2,990	7,046	776	2,564	3,339
Year	4,950	13,077	15,022	13,425	2,305	2,785	5,768	20,790	36,542	57,332	8,755	50,026	58,781

Table 13: Final Energy Consumption results for the Solar Office Building in Denver (PV Solar Array slope = 18°)



Figure 33: Final Energy Consumption results for the Solar Office Building in Denver (PV Solar Array slope = 18°)



Figure 34: Final Total Annual Consumption results for the Solar Office Building in Denver (PV Solar Array Slope = 18°

												PV F-	
Energy Needed (from PS-E, DOE-2.1e output)							F-Chart	Chart					
									Electric				
								Thermal	Only (No		Energy		
								Load	Heating		Available	Energy	Total
								(Heating	+ No		from	Available	Energy
	Lighting	Equipment	Heating	Cooling	Pump. & Misc.	Vent. Fans	DHW	+ DHW)	DHW)	TOTAL	Collector	from PV	Available
	kWh	kWh	kWh	kWh	kWh	kWh	kWh	kWh	kWh	kWh	kWh	kWh	kWh
Jan	548	1,088	3,396	784	196	233	535	3,931	2,849	6,780	807	3,716	4,522
Feb	450	999	2,778	750	177	211	499	3,277	2,587	5,864	734	3,809	4,543
Mar	433	1,140	1,886	828	196	233	554	2,440	2,830	5,270	803	4,647	5,450
Apr	307	1,098	855	873	189	226	528	1,383	2,693	4,076	752	4,768	5,519
May	272	1,088	395	1,041	196	233	511	906	2,830	3,736	742	4,723	5 <i>,</i> 466
Jun	369	1,098	23	1,331	189	227	460	483	3,214	3,697	689	4,718	5 <i>,</i> 406
Jul	333	1,105	0	1,904	196	245	445	445	3,783	4,228	682	4,836	5,517
Aug	287	1,122	0	1,760	196	247	426	426	3,612	4,038	674	4,811	5,485
Sep	260	1,081	56	1,428	189	233	411	467	3,191	3,658	663	4,614	5,277
Oct	372	1,088	372	1,125	196	238	440	812	3,019	3,831	711	4,547	5,258
Nov	653	1,064	1,709	808	189	226	454	2,163	2,940	5,103	722	3 <i>,</i> 693	4,415
Dec	664	1,105	3,552	792	196	233	504	4,056	2,990	7,046	776	3,470	4,246
Year	4,950	13,077	15,022	13,425	2,305	2,785	5,768	20,790	36,542	57,332	8,755	52,351	61,105

Table 14: Final Energy Consumption results for the Solar Office Building in Denver (PV Solar Array slope = 40°)



Figure 35: Final Energy Consumption results for the Solar Office Building in Denver (PV Solar Array slope = 40°)



Figure 36: Final Total Annual Energy Consumption results for the Solar Office Building in Denver (PV Solar Array slope = 40°)

The BIM-Model of the complex building was generated for Houston and Denver after creating the model into DOE-2.1e. The days of the renderings correspond to the design days used in DOE-2.1e for summer and winter. The days chosen were: August 9th (summer) and January 14th (winter) for Houston, and August 25th (summer) and February 3rd (winter) for Denver. There are some elements missing (i.e. the building lifted in the air on columns from the first two cases) that were used in the DOE-2.1e Model.

- 1) The building was lifted 10 ft. in the air to avoid the heat transfer with the ground. This basecase did not have a floor, windows, doors, infiltration or lighting. We try to validate the U-Value of the walls and roofs through code compliance, and the validation of the steady-state "q" through manual calculation only with the envelope.
- 2) We placed a floor to the building and validated the heating consumption by increasing the size of the floor.
- 3) The previous two points were entirely done through DOE-2.1e (thermal simulations) and DrawBDL Processor (3D-Modeling). This approach gave us the feedback to do the Revit Model of the Complex Office Building.
- 4) We put the building over the site. This time the building has floor, walls and roofs, but it still does not have any windows, doors, people, infiltration or lighting (see Figure 37). Due to the latitude, the shadow casted in summer on the walls in Denver is shorter than the shadow casted in Houston (Figures. 37a and 37b). On the other hand, the shadow cast for the winter season seems similar for Houston and Denver (Figures 37c and 37d). But, there is a small shadow near the edge of the upper side of the upper wall in Houston. The shadow cast in Denver is shorter than Houston.



Figure 37: BIM Office Building Model without any features

5) In Figure 38 we will start the development of high performance buildings using wise approach features applied to the basic model one by one:

5.1) Eight inch concrete block Trombé wall with four inch channel width and a single clear pane window. The Trombé wall is a passive solar feature that has to be

protected during the summer (Figures 38a and 38b). There are some openings that will allow cold air to push out the hot air from the interior. On the other hand, the Trombé wall during the winter will re-irradiate the heat accumulated during the day to the interior space during the night (Figures 38c and 38d). Therefore, the sun needs to strike it during the winter.



Figure 38: High Performance Building over the site with Trombé Wall

5.2) In Figure 39 a 4 ft. X 45 ft. double clear pane window near the east side on the lower south wall. The window is covered by an eave. The eave protects the south windows from the summer solar angle. This will avoid the solar access and the increase of the temperature in the interior space (Figures 39a and 39b). On the other hand, we want to allow the solar access through the windows during the winter season (Figures 39c and 39d).



Figure 39: High Performance Building over the site with Southern Windows

5.3) Figure 40 shows two (24 ft. X 24 ft. double clear pane windows on the north wall. The reflected daylighting from the north will be introduced through these two windows (Figures. 40a and 40d).



Figure 40: High Performance Building over the site with North Windows

5.4) A 3 ft. X 90 ft. double clear pane clerestory window in the upper south wall was added in Figure 41. The eave will protect the clerestory from the summer solar angle



and avoid the increase of temperature in the space (Figures 41a and 41 b). The daylighting for winter will be introduced through this clerestory on the upper south wall (Figures 41c and 41d).

Figure 41: High Performance Building over the site with Clerestory

6) We combined different features at this point.

6.1) Figure 42 shows a south window + clerestory. The eaves will protect the south windows and the clerestory from the summer solar angle (Figures 42a and 42b).



Figure 42: High Performance Building over the site with South Windows +Clerestory

6.2) South window + north windows + clerestory. This case is similar to the previous one plus the north windows.

6.3) Figure 43 shows a Trombé wall + south window + clerestory. The eaves will protect the Trombé wall and the south windows from the summer solar angle (Figures. 43a and43b).We try to let the solar access through the south windows and let the Trombé wall to be warm during the winter season (Figures. 43c and 43d). The Trombé wall is a passive solar feature that will re-irradiate the heat accumulated during the day to the interior space during the night.



Figure 43: High Performance Building over the site with Trombé Wall + South Windows +Clerestory

6.4) Trombé wall + south window + north windows + clerestory. This case is similar to the previous one plus the north windows.

6.5) In Figure 44, we see people + Trombé wall + south window + north windows + clerestory + DHW. This case will involve the solar thermal (DHW) simulation. The solar angles of the seasons change the tilt of the photovoltaic due to the latitude of Houston (Figures 44a and 44c) and Denver (Figures 44b and 44d).



Figure 44: High Performance Building over the site with Trombé Wall + South Windows +North Windows + Clerestory + DHW

6.6) South window + north windows + clerestory + DHW. This case is similar to the previous one without people. Some reports will be used to run the solar thermal simulation and the photovoltaic in the F-Chart and PV F-Chart, respectively.
6.7) South window + north windows + clerestory + daylighting sensors. This case will involve the placement of all the windows (south, north and clerestory) and turn on the interior daylighting sensors. The sensors will dim the amount of artificial light if the natural daylighting is enough to satisfy the lighting requirements for the working places.

- 7) The thermal simulation results from DOE-2.1e will be placed in a series of graphs.
- 8) Some results from DOE-2.1e will be used to analyze and simulate solar thermal (DHW) in the F-Chart and photovoltaic (PV) in the PV F-Chart.

5 RESULTS

The results show that the high performance solar office building for the NSF-PBIM project reduced annual energy consumption by 100 percent in both Houston and Denver as compared to a regular office building. By using the legacy tools, the Net-Zero Energy Office Building produces more energy than it consumes. We used some renewable energy systems to achieve the Net-Zero Energy. The renewable energy systems used were the solar Domestic Hot Water (DHW), the photovoltaic and daylighting (clerestory windows and daylighting sensors). The combination of different renewable energy systems (solar Domestic Hot Water (DHW), clerestory windows, daylighting sensors and photovoltaic) allowed the reduction of energy consumption in both Houston and Denver. The Trombé wall was omitted for the final analysis in the legacy tools, because of the low energy savings registered during the process.

6 SUMMARY

This report, which was created for the National Science Foundation-Physical Building Information Modeling (NSF-PBIM) project at Texas A&M University, describes the analysis of a solar office building using the following software: the legacy tools (DOE 2.1e, the F-Chart and the PV-F Chart) for whole-building energy analysis, solar thermal analysis and solar electric analysis; the Revit software that was used to render the images of the solar office building and get feedback for the DOE-2.1e; and the Inverse Model Toolkit (IMT) program to transfer data between the legacy tools. This report found that the on-site energy produced through the solar passive strategies (clerestory windows and southern windows), the artificial lighting saving sensors, solar collectors (DHW) and the photovoltaic is covering most of the energy consumed by the office building throughout the year in both Houston and Denver. Therefore, the office building is Net-Zero Energy Building. The Trombé wall was omitted for the final analysis in the legacy tools, because of the low energy savings registered during the process. These analyses were run during the first two years of the National Science Foundation Physical Building Information Modeling (NSF PBIM) project at Texas A&M University.

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TIT = 17 74	
S(DEGREES) = DEFAULT = 90	

SHADE-SCHEDULE = B-SH-1 .. \$ SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING BD14 = BUILDING-SHADE X = 8 Y = 0 Z = 18.5\$COORDINATES \$(FT) HEIGHT = 24WIDTH = 4\$(FT) AZIMUTH = 180\$(DEGREES) \$(0 TRANSMITTANCE = 0.0TO 1), DOE-2 DEFAULT = 0.9 TILT = 17.74(DEGREES), DEFAULT = 90SHADE-SCHEDULE = B-SH-1 .. \$ SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING BD15 = BUILDING-SHADE X = 12 Y = 0 Z = 18.5\$COORDINATES HEIGHT = 24\$(FT) WIDTH = 4\$(FT) AZIMUTH = 180\$(DEGREES) TRANSMITTANCE = 0.0\$(0 TO 1), DOE-2 DEFAULT = 0.9 TILT = 17.74(DEGREES), DEFAULT = 90SHADE-SCHEDULE = B-SH-1 ... \$ SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING BD16 = BUILDING-SHADE X = 16 Y = 0 Z = 18.5\$COORDINATES

HEIGHT = 24\$(FT) \$(FT) WIDTH = 4AZIMUTH = 180\$(DEGREES) TRANSMITTANCE = 0.0\$(0 TO 1), DOE-2 DEFAULT = 0.9 TILT = 17.74(DEGREES), DEFAULT = 90SHADE-SCHEDULE = B-SH-1 .. Ŝ SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING BD17 = BUILDING-SHADE X = 20 Y = 0 Z = 18.5\$COORDINATES HEIGHT = 24\$(FT) WIDTH = 4\$(FT) AZIMUTH = 180\$(DEGREES) \$(0 TRANSMITTANCE = 0.0TO 1), DOE-2 DEFAULT = 0.9 TILT = 17.74(DEGREES), DEFAULT = 90SHADE-SCHEDULE = B-SH-1 ... \$ SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING BD18 = BUILDING-SHADE X = 24 Y = 0 Z = 18.5\$COORDINATES HEIGHT = 24\$(FT) WIDTH = 4\$(FT) AZIMUTH = 180\$(DEGREES) \$(0 TRANSMITTANCE = 0.0TO 1), DOE-2 DEFAULT = 0.9

TILT = 17.74(DEGREES), DEFAULT = 90SHADE-SCHEDULE = B-SH-1 .. \$ SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING BD19 = BUILDING-SHADE X = 28 Y = 0 Z = 18.5\$COORDINATES HEIGHT = 24\$(FT) WIDTH = 4\$(FT) AZIMUTH = 180\$ (DEGREES) TRANSMITTANCE = 0.0\$(0 TO 1), DOE-2 DEFAULT = 0.9 TILT = 17.74(DEGREES), DEFAULT = 90SHADE-SCHEDULE = B-SH-1 ... \$ SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING BD20 = BUILDING-SHADE X = 32 Y = 0 Z = 18.5\$COORDINATES HEIGHT = 24\$(FT) WIDTH = 4\$(FT) AZIMUTH = 180\$(DEGREES) \$(0 TRANSMITTANCE = 0.0TO 1), DOE-2 DEFAULT = 0.9 TILT = 17.74(DEGREES), DEFAULT = 90SHADE-SCHEDULE = B-SH-1 ... \$ SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING

BD21 = BUILDING-SHADE

X = 36 Y = 0 Z = 18.5\$COORDINATES HEIGHT = 24\$(FT) WIDTH = 4\$(FT) AZIMUTH = 180\$(DEGREES) TRANSMITTANCE = 0.0\$(0 TO 1), DOE-2 DEFAULT = 0.9 TILT = 17.74(DEGREES), DEFAULT = 90SHADE-SCHEDULE = B-SH-1 .. Ŝ SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING BD22 = BUILDING-SHADEX = 40 Y = 0 Z = 18.5\$COORDINATES HEIGHT = 24\$(FT) WIDTH = 4\$(FT) AZIMUTH = 180\$(DEGREES) TRANSMITTANCE = 0.0\$(0 TO 1), DOE-2 DEFAULT = 0.9 TILT = 17.74(DEGREES), DEFAULT = 90SHADE-SCHEDULE = B-SH-1 .. \$ SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING BD23 = BUILDING-SHADEX = 44 Y = 0 Z = 18.5\$COORDINATES HEIGHT = 24\$(FT) WIDTH = 4\$(FT) AZIMUTH = 180\$(DEGREES)

TRANSMITTANCE = 0.0\$(0 TO 1), DOE-2 DEFAULT = 0.9 TILT = 17.74(DEGREES), DEFAULT = 90SHADE-SCHEDULE = B-SH-1 .. \$ SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING BD24 = BUILDING-SHADEX = 48 Y = 0 Z = 18.5\$COORDINATES HEIGHT = 24\$(FT) WIDTH = 4\$(FT) AZIMUTH = 180\$(DEGREES) TRANSMITTANCE = 0.0\$(0 TO 1), DOE-2 DEFAULT = 0.9 TILT = 17.74(DEGREES), DEFAULT = 90SHADE-SCHEDULE = B-SH-1 .. \$ SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING BD25 = BUILDING-SHADE X = 52 Y = 0 Z = 18.5\$COORDINATES HEIGHT = 24\$(FT) WIDTH = 4\$(FT) AZIMUTH = 180\$(DEGREES) \$(0 TRANSMITTANCE = 0.0TO 1), DOE-2 DEFAULT = 0.9 TILT = 17.74(DEGREES), DEFAULT = 90\$ SHADE-SCHEDULE = B-SH-1 ... SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING

BD26 = BUILDING-SHADEX = 56 Y = 0 Z = 18.5\$COORDINATES HEIGHT = 24\$(FT) WIDTH = 4\$(FT) AZIMUTH = 180\$(DEGREES) TRANSMITTANCE = 0.0\$(0 TO 1), DOE-2 DEFAULT = 0.9 TILT = 17.74(DEGREES), DEFAULT = 90SHADE-SCHEDULE = B-SH-1 ... SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING BD27 = BUILDING-SHADEX = 60 Y = 0 Z = 18.5\$COORDINATES HEIGHT = 24\$(FT) WIDTH = 4\$(FT) AZIMUTH = 180\$(DEGREES) TRANSMITTANCE = 0.0\$(0 TO 1), DOE-2 DEFAULT = 0.9 TILT = 17.74(DEGREES), DEFAULT = 90SHADE-SCHEDULE = B-SH-1 ... \$ SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING BD28 = BUILDING-SHADE X = 64 Y = 0 Z = 18.5\$COORDINATES HEIGHT = 24\$(FT) WIDTH = 4\$(FT)

AZIMUTH = 180\$(DEGREES) \$(0 TRANSMITTANCE = 0.0TO 1), DOE-2 DEFAULT = 0.9 TILT = 17.74(DEGREES), DEFAULT = 90SHADE-SCHEDULE = B-SH-1 .. \$ SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING BD29 = BUILDING-SHADEX = 68 Y = 0 Z = 18.5\$COORDINATES HEIGHT = 24\$(FT) WIDTH = 4\$(FT) AZIMUTH = 180\$(DEGREES) TRANSMITTANCE = 0.0\$(0 TO 1), DOE-2 DEFAULT = 0.9 TILT = 17.74(DEGREES), DEFAULT = 90SHADE-SCHEDULE = B-SH-1 .. \$ SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING BD30 = BUILDING-SHADE X = 72 Y = 0 Z = 18.5\$COORDINATES HEIGHT = 24\$(FT) \$(FT) WIDTH = 4AZIMUTH = 180\$(DEGREES) TRANSMITTANCE = 0.0\$(0 TO 1), DOE-2 DEFAULT = 0.9 TILT = 17.74(DEGREES), DEFAULT = 90

August 2012
SHADE-SCHEDULE = B-SH-1 .. \$ SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING BD31 = BUILDING-SHADE X = 76 Y = 0 Z = 18.5\$COORDINATES HEIGHT = 24\$(FT) WIDTH = 4\$(FT) AZIMUTH = 180\$(DEGREES) TRANSMITTANCE = 0.0\$(0 TO 1), DOE-2 DEFAULT = 0.9 TILT = 17.74(DEGREES), DEFAULT = 90SHADE-SCHEDULE = B-SH-1 .. SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING BD32 = BUILDING-SHADEX = 80 Y = 0 Z = 18.5\$COORDINATES HEIGHT = 24\$(FT) WIDTH = 4\$(FT) AZIMUTH = 180\$(DEGREES) \$(0 TRANSMITTANCE = 0.0TO 1), DOE-2 DEFAULT = 0.9 TILT = 17.74(DEGREES), DEFAULT = 90SHADE-SCHEDULE = B-SH-1 .. Ŝ SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING BD33 = BUILDING-SHADE X = 84 Y = 0 Z = 18.5\$COORDINATES

\$(FT) \$(FT) WIDTH = 4AZIMUTH = 180\$(DEGREES) TRANSMITTANCE = 0.0\$(0 TO 1), DOE-2 DEFAULT = 0.9 TILT = 17.74(DEGREES), DEFAULT = 90SHADE-SCHEDULE = B-SH-1 .. \$ SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING BD34 = BUILDING-SHADE X = 88 Y = 0 Z = 18.5\$COORDINATES HEIGHT = 24\$(FT) WIDTH = 4\$(FT) AZIMUTH = 180\$(DEGREES) \$(0 TRANSMITTANCE = 0.0TO 1), DOE-2 DEFAULT = 0.9 TILT = 17.74(DEGREES), DEFAULT = 90SHADE-SCHEDULE = B-SH-1 .. \$ SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING BD35 = BUILDING-SHADE X = 92 Y = 0 Z = 18.5\$COORDINATES HEIGHT = 24\$(FT) WIDTH = 4\$(FT) AZIMUTH = 180\$(DEGREES) \$(0 TRANSMITTANCE = 0.0TO 1), DOE-2 DEFAULT = 0.9

HEIGHT = 24

TILT = 17.74		***********
(DEGREES), DEFAULT = 90		* * * * * * * * * * * * * * * * *
SHADE-SCHEDULE = B-SH-1	\$	\$
SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THE	ESE	* * * * * * * * * * * * * * * * *
COMMANDS ARE USED FOR DAYLIGHTING		***** MATERI
		* * * * * * * * * * * * * * * * * *
BD36 = BUILDING-SHADE		* * * * * * * * * * * * *
X = 96 Y = 0 Z = 18.5		\$
\$COORDINATES		* * * * * * * * * * * * * * * * * *
HEIGHT = 24		* * * * * * * * * * * * * * * *
\$(FT)		* * * * * * * * * * * * * * * * *
WIDTH = 4	\$(FT)	
AZIMUTH = 180		BUILTUP-ROOFING
\$(DEGREES)		DOE2.1E (REFERENC
TRANSMITTANCE = 0.0	\$(0	LIBRARY)
TO 1), $DOE-2$ DEFAULT = 0.9		THICKNESS
TILT = 17.74		CONDUCTIVITY
(DEGREES), DEFAULT = 90		\$(BTU.FT/HR.FT^2
SHADE-SCHEDULE = B-SH-1	\$	DENSITY
SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, TH	ESE	SPECIFIC-HEAT
COMMANDS ARE USED FOR DAYLIGHTING		
		ROOF-GRAVEL-MAT
\$		DOE2.1E (REFERENC
*****	* * * * * * * * * *	LIBRARY)
*****	* * * * * * * * * *	THICKNESS

\$		CONDUCTIVITY
************	* * * * * * * * * *	\$(BTU.FT/HR.FT^2
* BUILDING DESCRIPTION		DENSITY
*****	* * * * * * * * * *	SPECIFIC-HEAT
* * * * * * *		
\$		POLY-EXP
· ************************************	* * * * * * * * * *	in. FROM REFEREN
*****	* * * * * * * * * *	LIBRARY)
******		THICKNESS
		CONDUCTIVITY
		\$(BTU.FT/HR.FT^2
\$		DENSITY

* * * * * * * * * * * * * * * * * * * *	***********	* * * * * * * * * * * * * *
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\$		
· · · · · · · · · · · · · · · · · · ·	* * * * * * * * * * * * * * *	* * * * * * * * * * * * * *
***** MATERIALS		
*****	*****	* * * * * * * * * * * * *
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Ś		
' * * * * * * * * * * * * * * * * * * *	*****	* * * * * * * * * * * * * *
* * * * * * * * * * * * * * * * * * * *	*****	* * * * * * * * * * * * *
* * * * * * * * * * * * * * * * * * * *	*****	*
BUILTUP-ROOFING-MAT	= MATERIAL	Ś
DOE2 1E (REFERENCE 2ND	PART X B 2 MZ	ATERTALS
LIBRARY)	1/11(1 /1.0.2 10	
THICKNESS	= 0 0313	\$ (FT)
CONDUCTIVITY	= 0 0939	Ŷ(II)
S(BTU FT/HR FT^2 F)	0.0909	
DENSTTY	= 70	\$ (LB/ምም^3)
SPECIFIC-HEAT	= 0.35	S(BTIL/LB F)
	0.00	(D10/10.1)
ROOF-GRAVEL-MAT	= MATERIAL	Ś
DOE2 1E (REFERENCE 2ND	PART X B 7 M	ATERTALS
LIBRARY)	I MILL M. D. / IM	
THICKNESS	= 0 0417	\$ (FT)
	0.011/	Ŷ(II)
CONDUCTIVITY	= 0 834	
S(BTIL FT/HR FT^2 F)	0.001	
DENSTTY	= 55	\$(LB/FT^3)
SDECIFIC-HEAT	= 0 4	
STECIFIC MERI	- 0.1	ФТО/ШС.Г/
POLY-EXP =	ΜΔΨΈΡΤΔΙ	S DOE2 1E(4
in FROM REFERENCE 2NI	PART X R 9 1	VATERIALS
LIBRARY)		
THICKNESS	= 0 4166	\$ (ፑጥ)
CONDUCTIVITY	= 0.02	Y \
S(BTIL FT/HR FT^2 F)	0.02	
DENSTTY	= 1 8	\$(I.B/FT^3)
SDECIEIC-HEAT	= 0.29	
OFFICITO HEAT	U.2.7	$ \sqrt{D + O + O + D + E} $

BRICK-4" = MATERIAL \$ DOE2.1E(FROM REFERENCE 2ND PART X.B.2 MATERIALS LIBRARY) THICKNESS = 0.3333\$(FT) CONDUCTIVITY = 0.4167\$(BTU.FT/HR.FT^2.F) \$(LB/FT^3) DENSITY = 120SPECIFIC-HEAT = 0.2 \$(BTU/LB.F) . . MIN-WOOL-FIB = MATERIAL \$ DOE2.1E (FROM REFERENCE 2ND PART X.B.9 MATERIALS LIBRARY) THICKNESS = 0.2957\$ BATT, R-11 = 0.0250CONDUCTIVITY \$(BTU.FT/HR.FT^2.F) DENSITY = 0.60 \$(LB/FT^3) = 0.2 .. SPECIFIC-HEAT \$(BTU/LB.F) GYPSUM = MATERIAL \$ DOE2.1E(HOLLOW GYPSUM BOARD FROM REFERENCE 2ND PART X.B.6 MATERIALS LIBRARY) THICKNESS = 0.0417\$(FT) CONDUCTIVITY = 0.0926\$(BTU.FT/HR.FT^2.F) DENSITY = 49.0\$(LB/FT^3) SPECIFIC-HEAT = 0.2 ... \$(BTU/LB.F) AIR-LAYER-HALF-INCH = MATERIAL \$ DOE2.1E(AIR LAYER, 34 IN. OR LESS FOR VERTICAL WALLS FROM REFERENCE 2ND PART X.B.11 MATERIALS LIBRARY) RESISTANCE = 0.9 .. \$(HR.FT^2.F/BTU) PLASTIC-FILM-SEAL = MATERIAL \$ DOE2.1E (BUILDING PAPER TYPE FROM REFERENCE 2ND PART X.B.2 MATERIALS LIBRARY) REPRESENTING TAR-PAPER

RESISTANCE = 0.01 ... \$(HR.FT^2.F/BTU) PLYWOOD-HALF-INCH = MATERIAL \$ DOE2.1E(FROM REFERENCE 2ND PART X.B.7 MATERIALS LIBRARY) THICKNESS = 0.0417\$(FT) CONDUCTIVITY = 0.0667\$(BTU.FT/HR.FT^2.F) = 34.0 DENSITY \$(LB/FT^3) SPECIFIC-HEAT = 0.29 .. \$(BTU/LB.F) SOFT-WOOD = MATERIAL \$ DOE2.1E(3/4 IN. FROM REFERENCE 2ND PART X.B.8 MATERIALS LIBRARY) THICKNESS = 0.0625\$(FT) = 0.0667CONDUCTIVITY \$(BTU.FT/HR.FT^2.F) DENSITY = 34 \$(LB/FT^3) SPECIFIC-HEAT = 0.33 .. \$(BTU/LB.F) SOIL-12IN = MATERIAL \$ SOIL LAYER (FROM BUILDING ENERGY SIMULATION VOL. 23, No.6, PAGES 21-22 WINKELMANN MEMO) THICKNESS = 1.0\$(FT) = 1.0CONDUCTIVITY \$(BTU.FT/HR.FT^2.F) DENSITY = 115\$(LB/FT^3) \$(BTU/LB.F) SPECIFIC-HEAT = 0.1 .. CONCRETE-HE-WEIGHT = MATERIAL \$ DOE2.1E(4 IN., DRIED AGGREGATE, 140 LB. FROM REFERENCE 2ND PART X.B.3 MATERIALS LIBRARY) = 0.33 \$(FT) THICKNESS CONDUCTIVITY = 0.7576\$(BTU.FT/HR.FT^2.F) DENSITY = 140.0\$(LB/FT^3) = 0.2 .. \$(BTU/LB.F) SPECIFIC-HEAT

CONCRETE-BLOCK-8" = MATERIAL \$ DOE2.1E(CONCRETE FILLED FROM REFERENCE 2ND PART X.B.6 MATERIALS LIBRARY) THICKNESS = 0.6667\$(FT) CONDUCTIVITY = 0.4359\$(BTU.FT/HR.FT^2.F) DENSITY = 115.0\$(LB/FT^3) = 0.2 ... SPECIFIC-HEAT \$(BTU/LB.F) CONCRETE-LI-WEIGHT = MATERIAL \$ DOE2.1E(4 IN., 80 LB. FROM REFERENCE 2ND PART X.B.5 MATERIALS LIBRARY) THICKNESS = 0.33 \$(FT) = 0.2083CONDUCTIVITY \$(BTU.FT/HR.FT^2.F) = 80.0 \$(LB/FT^3) DENSITY SPECIFIC-HEAT = 0.2 .. \$(BTU/LB.F) POLY-EXP-2 = MATERIAL \$ DOE2.1E(4 in. FROM REFERENCE 2ND PART X.B.9 MATERIALS LIBRARY) = 0.3333THICKNESS \$(FT) = 0.02CONDUCTIVITY \$(BTU.FT/HR.FT^2.F) = 1.8 \$(LB/FT^3) DENSITY SPECIFIC-HEAT $= 0.29 \dots$ \$ (BTU/LB.F) MINERAL-WOOL1 = MATERIAL \$DOE2.1E(MATERIALS LIBRARY, REFERENCED FROM IECC1107 FILE) = 0.2917THICKNESS \$(FT) = 0.027CONDUCTIVITY \$(BTU.FT/HR.FT^2.F) DENSITY = 0.6 \$(LB/FT^3) SPECIFIC-HEAT = 0.2 ... \$(BTU/LB.F) SOFT-WOOD1 = MATERIAL \$DOE2.1E(MATERIALS LIBRARY, REFERENCED FROM IECC1107 FILE)

THICKNESS = 0.2083\$(FT) = 0.0667CONDUCTIVITY \$(BTU.FT/HR.FT^2.F) DENSITY = 32 \$(LB/FT^3) = 0.33 .. SPECIFIC-HEAT \$(BTU/LB.F) ****************************** LAYERS ***** * * * * * * * * * * * * * * * * * * ***** WA-1-2 = LAYERS \$ LAYERS FOR THE EXTERIOR WALL CONSTRUCTION INSIDE-FILM-RES = 0.6800\$ HR-SQFT-F /BTU (REFERENCE FROM IECC1107) MATERIAL = (AIR-LAYER-HALF-INCH, BRICK-4", PLASTIC-FILM-SEAL, PLYWOOD-HALF-INCH, MIN-WOOL-FIB, GYPSUM, AIR-LAYER-HALF-INCH).. \$ MATERIALS FROM OUTSIDE TO INSIDE WA-1-3 \$ LAYERS FOR = LAYERS THE EXTERIOR WALL CONSTRUCTION INSIDE-FILM-RES = 0.6800\$ HR-SOFT-F /BTU (REFERENCE FROM IECC1107) MATERIAL = (POLY-EXP-2, CONCRETE-LI-WEIGHT).. \$ MATERIALS FROM OUTSIDE TO INSIDE R00-1 = LAYERS \$ LAYERS FOR THE ROOF CONSTRUCTION INSIDE-FILM-RES = 0.76\$ HR-SQFT-F /BTU (REFERENCE FROM IECC1107)

MATERIAL = (ROOF-GRAVEL-MAT,BUILTUP-ROOFING-MAT,POLY-EXP,SOFT-WOOD).. \$ MATERIALS FROM OUTSIDE TO INSIDE

DOOR-LAY1 = LAYERS \$ REFERENCED FROM IECC1107 FILE MATERIAL = (GYPSUM, MINERAL-WOOL1, SOFT-WOOD1, GYPSUM) ..

 $WAT_T - 1$ = CONSTRUCTION \$ EXTERIOR WALL CONSTRUCTION (LAYERED CONSTRUCTION) LAYERS = WA - 1 - 2\$ LAYERS OF THE EXTERIOR WALL CONSTRUCTION ABSORPTANCE = 0.7000\$ DOE-2.1E DEFAULT FROM REFERENCE PT1 III.47 ROUGHNESS = 3.0000\$ DOE-2.1E . . DEFAULT FROM REFERENCE PT1 III.47

WALL-2 = CONSTRUCTION \$ EXTERIOR WALL CONSTRUCTION (LAYERED CONSTRUCTION) LAYERS = WA-1-3 \$ LAYERS OF THE EXTERIOR WALL CONSTRUCTION ABSORPTANCE = 0.7000 \$ DOE-2.1E DEFAULT FROM REFERENCE PT1 III.47 ROUGHNESS = 3.0000 \$ DOE-2.1E DEFAULT FROM REFERENCE PT1 III.47 ROOF-1 = CONSTRUCTION \$ ROOF CONSTRUCTION (LAYERED CONSTRUCTION) LAYERS = ROO - 1\$ LAYERS OF THE ROOF CONSTRUCTION (LAYERED CONSTRUCTION) = 0.7000ABSORPTANCE \$ DOE-2.1E DEFAULT FROM REFERENCE PT1 III.47 ROUGHNESS = 3,0000 \$ DOE-2.1E DEFAULT FROM REFERENCE PT1 III.47 DOOR-1 = CONSTRUCTION \$ REFERENCED FROM IECC1107 FILE) LAYERS = DOOR-LAY1 = 0.2 .. U \$ IECC 2001 (RESIDENTIAL BUILDING) (BTU/HR.FT^2.F) \$ Ś

\$ THE SIMULATION TOOL (DOE-2.1E) CAN ACCEPT CUSTOM WINDOWS DESIGNED USING WINDOWS-5 (LBNL) PROGRAM AS A \$ REASON WINDOWS AND DOORS ARE MODELED USING WINDOWS-5 (LBNL) PROGRAM FOR CONSISTANCY .

W-1 =	GLASS-TYPE			FRAME-ABS	=	:	0.7000	4	\$ FROM
\$ CUSTOM WINDOW FOR LOW?	ER SOUTH FRONT WAT	LL	AND	THE WINDOWS-5	LIBF	ARY			
BACK WINDOWS (WINDOWS-5)			CONVERGENCE-TO	L =	:	0.0000	•••	\$ FROM
GLASS-TYPE-CODE =	2001	\$	GLASS	THE WINDOWS-5	LIBR	ARY			
TYPE CODE									
PANES =	1.0000	\$	FROM	\$					
THE WINDOWS-5 LIBRARY				*******	* * * *	*****	******	* * * * * * * * * * *	******
GLASS-CONDUCTANC =	1.4700	\$	FROM	*******	* * * *	*****	******	* * * * * * * * * * *	******
THE WINDOWS-5 LIBRARY				*******	* * * *	*****	******	* * * *	
VIS-TRANS =	0.9000	\$	FROM	\$					
THE WINDOWS-5 LIBRARY				*******	* * * *	*****	******	* * * * * * * * * * *	******
INSIDE-EMISS =	0.8400	\$	FROM	**** OCCUPA	NCY	SCHEDUI	LE		
THE WINDOWS-5 LIBRARY				* * * * * * * * * * * * * *	* * * *	*****	******	* * * * * * * * * * *	******
OUTSIDE-EMISS =	0.8400	\$	FROM	* * * * *					
THE WINDOWS-5 LIBRARY				\$					
SPACER-TYPE-CODE =	1.0000	\$	FROM	* * * * * * * * * * * * * *	* * * *	*****	******	* * * * * * * * * * *	******
THE WINDOWS-5 LIBRARY (2	ALUMINIUM)			* * * * * * * * * * * * * *	****	******	******	* * * * * * * * * * *	******
FRAME-ABS =	0.7000	\$	FROM	* * * * * * * * * * * * * *	* * * *	*****	******	* * * *	
THE WINDOWS-5 LIBRARY									
CONVERGENCE-TOL =	0.0000	\$	FROM	OC-1	=	DAY-SCH	HEDULE	(1,8) (0.0))
THE WINDOWS-5 LIBRARY								(9,11) (1. (12,14)	.0)
W-2 =	GLASS-TYPE			(0.8, 0.4, 0.8)					
\$ CUSTOM WINDOW FOR UPP:	ER SOUTH FRONT WA	LL		(,				(15,18) (1	1.0)
WINDOWS (WINDOWS-5)								(19,21)	,
GLASS-TYPE-CODE =	2001	\$	GLASS	(0, 5, 0, 1, 0, 1)				(/	
TYPE CODE		·		(,,,				(22, 24) (0),())
PANES =	1.0000	\$	FROM					(,, (,
THE WINDOWS-5 LIBRARY				0C-2	= D	AY-SCH	EDULE	(1, 24) (0.	0)
GLASS-CONDUCTANC =	1.4700	\$	FROM				-		,
THE WINDOWS-5 LIBRARY				OC-WEEK	= W	EEK-SCH	HEDULE	(WD) OC-1	(WEH)
VIS-TRANS =	0.9000	\$	FROM	OC-2				((,
THE WINDOWS-5 LIBRARY				OCCUPY-1	= S	CHEDULE	E	THRU DEC 3	31 OC-
INSIDE-EMISS =	0.8400	\$	FROM	WEEK					
THE WINDOWS-5 LIBRARY									
OUTSIDE-EMISS =	0.8400	\$	FROM	Ś					
THE WINDOWS-5 LIBRARY		'		* * * * * * * * * * * * * * *	****	*****	******	* * * * * * * * * * *	******
SPACER-TYPE-CODE =	1.0000	\$	FROM	* * * * * * * * * * * * * *	****	*****	******	* * * * * * * * * * *	******
THE WINDOWS-5 LIBRARY (ALUMINIUM)			* * * * * * * * * * * * * * *	****	*****	******	* * * *	

\$						
* * * * * * * * * * * * * * * *	* * * * * * * * * * * * *	EQ-1		=DAY-SCHEDULE	(1,8) (0.02)	
**** LIGHTI	NG SCHEDULE					(9,14)
* * * * * * * * * * * * * * * *	* * * * * * * * * * * * * * * * * * * *	* * * * * * * * * * * * *	(0.4,0.9	,0.9,0.	.9,0.9,0.9)	
* * * * * *						(15,20)
\$		(0.8,0.7	,0.5,0.	.5,0.3,0.3)		
* * * * * * * * * * * * * * * *	* * * * * * * * * * * *				(21,24) (0.02)	
* * * * * * * * * * * * * * * *	* * * * * * * * * * * * * * * * * * * *	* * * * * * * * * * * * *	••			
******	* * * * * * * * * * * * * * * * * * * *		EQ-2		=DAY-SCHEDULE	(1,24) (0.2)
			••			/
LT-1	=DAY-SCHEDULE	(1,8) (0.05)	EQ-WEEK		=WEEK-SCHEDULE	(MON,FRI) EQ-1
		(9,18) (1.0)	(WEH) EQ	2	~~~~~	
SOFFICE2 LIGHT	ING SCHEDULE HAS BEEN HOURS.	SET TO ONE	EQUIP-I EQ-WEEK		=SCHEDULE	THRU DEC 31
		(19,24)				
(0.05)			\$			
			* * * * * * * *	******	* * * * * * * * * * * * * * * * * * * *	*****
LT-2	=DAY-SCHEDULE	(1,24) (0.05)	* * * * * * * *	******	* * * * * * * * * * * * * * * * * * * *	****
••			* * * * * * * *	******	* * * * * * * * * * * * * * * * * * * *	*
			\$			
LT-WEEK	=WEEK-SCHEDULE	(MON,FRI) LT-	******	******	* * * * * * * * * * * * * * * * * * * *	*****
1 (WEH) LT-2			* * * * *	INFILTE	RATION SCHEDULE	
			* * * * * * * *	******	* * * * * * * * * * * * * * * * * * * *	*****
LIGHTS-1	=SCHEDULE	THRU DEC 31	* *			
LT-WEEK			\$			
			******	******	* * * * * * * * * * * * * * * * * * * *	*****
Ş			***************************************			
****	* * * * * * * * * * * * * * * * * * * *	* * * * * * * * * * * * *	******	******	* * * * * * * * * * * * * * * * * * * *	*
****	* * * * * * * * * * * * * * * * * * * *	* * * * * * * * * * * * *				
*****	* * * * * * * * * * * * * * * * * * * *					
Ş 			Ş			
	**********	* * * * * * * * * * * * *	***************************************			
***** EQUIPM	ENT SCHEDULE		***************************************			
* * * * * * * * * * * * * * * *	~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~	~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~	~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~			~
č			$\dot{\gamma}$	++++++		· + + + + + + + + + + + + + + + + + + +
ት ት ት ት ት ት ት ት ት ት ት ት ት ት ት ት ት ት ት	* * * * * * * * * * * * * * * * * * * *	* * * * * * * * * * * * *	****	CENEDAT	CDACE DEETNITTONS	
****	* * * * * * * * * * * * * * * * * * * *	****	******	GUNDKAI	~ > + + + + + + + + + + + + + + + + + +	****
****	****					

\$ AREA = 5000	

**************************************	DE2
DEFAULTS	
OFFICE = SPACE-CONDITIONS Z = 10.0000 \$ D(DE2
DEFAULTS	
AZIMUTH = 0.0000 \$ DC	DE2
\$ DEFAULTS	
**************************************	DE2

**************************************	ECC
\$ 2001.402.1.3.3.DOE2 DEFAULTS IS 70	200

**** SPECIFIC SPACE DETAILS PEOPLE-SCHEDULE = OCCUPY-1	
	ንም ጋ
	ש ביו ע
	ាចាប
	J <u>C</u> Z
	<u>~</u>
PEOPLE-HG-SENS = 252.2)ヒረ
EQUIP-SCHEDULE = EQUIP-I	
\$ EQUIPMENT-W/SQFT = 1 $$$ DO	DE2

**************************************	DE2

\$ TEMPERATURE = (73) $$$ DO	DE2

**** SPACE1-1 SOURCE-TYPE = ELECTRIC \$ DO	DE2

** SOURCE-POWER = 0.0000 \$ DO	DE2
\$ DEFAULTS	
****** EQUIP-LATENT = 0.0000 \$ D(DE2

**************************************	DE2
DEFAULTS	
SPACE1-1 = SPACE SOURCE-LATENT = 0.5 \$ DO	DE2
ZONE-TYPE = CONDITIONED \$ DOE2 DEFAULTS	
DEFAULTS	

SOURCE-SENSIBLE	= 0.4	\$ DOE2	HEIGHT	= 8
DEFAULTS			WIDTH	= 100
FLOOR-MULTIPLIER	= 1.0000	Ş DOE2	Х	= 0
DEFAULTS			Y	= 0
LIGHTING-SCHEDULE	= LIGHTS-1		Z	= 0
LIGHTING-TYPE	= REC-FLUOR-F	RV	AZIMUTH	= 180
LIGHT-TO-SPACE	= 0.80		CONSTRUCTION	= WALL-1
LIGHTING-W/SQFT	= 1.5		TILT	= 90.0000
DAYLIGHTING	= YES	\$ DAYLIGHING	DEFAULTS	
OPTION IS SWITCHED ON	I			
LIGHT-REF-POINT1 =	= (25,25,2.7)	\$ LOCATION OF	WF-1	= WINDOW
THE FIRST DAYLIGHT SE	ENSOR		WIDTH	= 45
LIGHT-REF-POINT2 =	= (75,25,2.7)	\$ LOCTION OF	HEIGHT	= 4.0000
THE SECOND DAYLIGHT S	SENSOR		Х	= 52.5
ZONE-FRACTION1 =	= 0.5	\$ FRACTION OF	Y	= 3.0000
THE ZONE CONTROLLED E	BY SENSOR 1		GLASS-TYPE	= W - 1
ZONE-FRACTION2	= 0.5	\$ FRACTION OF		
THE ZONE CONTROLLED E	BY SENSOR 2		FRONT-2	= EXTERIOR-WALL
LIGHT-SET-POINT1	= 50	\$ TARGET	HEIGHT	= 8
ILLUMINATION (FC) REQ	QUIRED AT SENS	SOR 1	WIDTH	= 100
LIGHT-SET-POINT2	= 50	\$ TARGET	Х	= 0
ILLUMINATION (FC) REQ	QUIRED AT SENS	SOR 2	Y	= 25
LIGHT-CTRL-TYPE1	= CONTINUOUS	\$ TYPE OF	Z	= 16
LIGHTING CONTROL FOR	PORTRION OF Z	IONE AREA	AZIMUTH	= 180
CONTROLLED BY SENSOR	1		CONSTRUCTION	= WALL-1
LIGHT-CTRL-TYPE2	= CONTINUOUS	\$ TYPE OF	TILT	= 90.0000
LIGHTING CONTROL FOR	PORTRION OF Z	IONE AREA	DEFAULTS	
CONTROLLED BY SENSOR	2			
MIN-POWER-FRAC	= 0	\$ LOWEST	WF-2	= WINDOW
INPUT POWER FRACTION	FOR CONTINUOU	JSLY DIMMABLE	WIDTH	= 90
LIGHING CONTROL SYSTE	EM		HEIGHT	= 3.0000
MIN-LIGHT-FRAC	= 0	\$ SPECIFIES	Х	= 5
THE FRACTIONAL LIGHT	OUTPUT THAT A	CONTINUOUSLY	Y	= 4.0000
DIMNMABLE			GLASS-TYPE	$= W - 2 \dots$
		\$ LIGHTING		
CONTROL SYSTEM PRODUC	CES AT THE MIN	IIMUM	PR1	= POLYGON \$ FROM
FRACTIONAL INPUT POWE	ER GIVEN BY MI	N-POWER-FRAC	DOCUMENTATION UPDATE	PACKAGE #2 PAGE 2

FRONT-1 = EXTERIOR-WALL \$ DOE2

\$ DOE2

#2 PAGE 2.129

August 2012

			\$RIGHT-FIN-B	= 0.0	DOE-2
(100,0,0) $(100,50,0)$ $(100,50,8)$ $(100,25,24)$			DEFAULT, UNUSED(FT)		
(100, 25, 16) $(100, 0, 8)$)		\$RIGHT-FIN-H	= 0.0	DOE-2
RIGHT-1 = EXTERIOR-	WALL POLYG	ON = PR1	DEFAULT, UNUSED(FT)		
Х	= 100		\$RIGHT-FIN-D	= 0.0	DOE-2
Y	= 0		DEFAULT, UNUSED (FT)		
Z	= 0		\$INF-COEF	= 0.0	USED IF
CONSTRUCTION	= WALL-1		INFILTRATION METHOD	=CRACK(0 TO 1	.60)
			SKY-FORM-FACTOR	= 0.5	\$ARBITRARY
DR-1	= DOOR \$(R	EFERENCED FROM	VALUE(0 TO 1)		
IECC1107 FILE)			GND-FORM-FACTOR	= 0.5	\$ARBITRARY
WIDTH	= 3		VALUE(0 TO 1)		
HEIGHT	= 7		\$SHADING-DIVISIONS	= 10	
Х	= 25		INSIDE-VIS-REFL	= 0.0	\$DOE-2
Y	= 0		DEFAULT, FOR DAYLIGH	TING CALC(0 I	O 1)
SETBACK = 0.0		\$(FT)			
CONSTRUCTION	= DOOR-1		DR-2	= DOOR \$(RE	FERENCED FROM
\$MULTIPLIER	=	UNUSED	IECC1107 FILE)		
\$OVERHANG-A	= 0.0	DOE-2	WIDTH	= 3	
DEFAULT, UNUSED (FT)			HEIGHT	= 7	
\$OVERHANG-B	= 0.0	DOE-2	Х	= 22	
DEFAULT, UNUSED (FT)			Y	= 0	
\$OVERHANG-W	= 0.0	DOE-2	SETBACK = 0.0		\$(FT)
DEFAULT, UNUSED (FT)			CONSTRUCTION	= DOOR-1	
\$OVERHANG-D	= 0.0	DOE-2	\$MULTIPLIER	=	UNUSED
DEFAULT, UNUSED(FT)			\$OVERHANG-A	= 0.0	DOE-2
\$OVERHANG-ANGLE	= 0.0	DOE-2	DEFAULT, UNUSED(FT)		
DEFAULT, UNUSED (DEGR	EES)		\$OVERHANG-B	= 0.0	DOE-2
\$LEFT-FIN-A	= 0.0	DOE-2	DEFAULT, UNUSED(FT)		
DEFAULT, UNUSED(FT)			\$OVERHANG-W	= 0.0	DOE-2
\$LEFT-FIN-B	= 0.0	DOE-2	DEFAULT, UNUSED(FT)		
DEFAULT, UNUSED(FT)			\$OVERHANG-D	= 0.0	DOE-2
\$LEFT-FIN-H	= 0.0	DOE-2	DEFAULT, UNUSED(FT)		
DEFAULT, UNUSED(FT)			\$OVERHANG-ANGLE	= 0.0	DOE-2
\$LEFT-FIN-D	= 0.0	DOE-2	DEFAULT, UNUSED (DEGR	EES)	
DEFAULT, UNUSED(FT)			\$LEFT-FIN-A	= 0.0	DOE-2
\$RIGHT-FIN-A	= 0.0	DOE-2	DEFAULT, UNUSED (FT)		
DEFAULT, UNUSED (FT)			\$LEFT-FIN-B	= 0.0	DOE-2
			DEFAULT, UNUSED(FT)		

\$LEFT-FIN-H	= 0.0	DOE-2	WB-2	= WINDOW	
DEFAULT, UNUSED (FT)			WIDTH	= 24	
ŞLEFT-FIN-D	= 0.0	DOE-2	HEIGHT	= 4.0000	
DEFAULT, UNUSED (FT)			X	= 65	
\$RIGHT-FIN-A	= 0.0	DOE-2	Y	= 3.0000	
DEFAULT, UNUSED(FT)			GLASS-TYPE	$= W - 1 \dots$	
\$RIGHT-FIN-B	= 0.0	DOE-2			
DEFAULT, UNUSED(FT)			PL1	= POLYGON \$ F	ROM
\$RIGHT-FIN-H	= 0.0	DOE-2	DOCUMENTATION UPDATE	PACKAGE #2 PA	GE 2.129
DEFAULT, UNUSED(FT)					
\$RIGHT-FIN-D	= 0.0	DOE-2			
DEFAULT, UNUSED(FT)			(0, 50, 0) (0, 0, 0) (0, 0, 0)	8)(0,25,16)	
\$INF-COEF	= 0.0	USED IF	(0,25,24)(0,50,8)	••	
INFILTRATION METHOD=	CRACK(0 TO 16))	LEFT-1	= EXTERIOR-WA	LL POLYGON =
SKY-FORM-FACTOR	= 0.5	ŞARBITRARY	PL1		
VALUE(0 TO 1)			Х	= 0	
GND-FORM-FACTOR	= 0.5	\$ARBITRARY	Y	= 50	
VALUE(0 TO 1)			Z	= 0	
\$SHADING-DIVISIONS	= 10		CONSTRUCTION	= WALL-1	
INSIDE-VIS-REFL	= 0.0	\$DOE-2			
DEFAULT, FOR DAYLIGHT	TING CALC(0 TO	1)	DR-3	= DOOR \$(REFE	RENCED FROM
- ,			IECC1107 FILE)		
BACK-1	= EXTERIOR-W	ALL	WIDTH	= 3	
НЕТСНТ	= 8		НЕТСНТ	= 7	
WIDTH	= 100		X	= 2.5	
X	= 100		Y	= 0	
Ŷ	= 50		SETBACK = 0.0	Ũ	\$(FT)
7.	= 0		CONSTRUCTION	= DOOR-1	+ (= =)
АЛТМИТН	= 0		\$MULTTPLIER	=	UNUSED
CONSTRUCTION	= WAT.T1		SOVERHANG-A	= 0 0	DOE - 2
TIT	= 90 0000	SDEGREES	DEFAILT UNUSED (FT)	0.0	
	50.0000		SOVERHANG-B	= 0 0	DOF = 2
WB-1			DEFAILT UNUSED (FT)	0.0	
	= 24		SOVERHANG-W	= 0 0	DOF = 2
			DEFAULT UNLIGED (FT)	- 0.0	
V	- 11		SOURDHANC-D	- 0 0	
A V	- 3 0000			- 0.0	
	- J.0000			- 0 0	
GTV22-IILF	- w-i		YUVERNANG-ANGLE		
			DEFAULT, UNUSED (DEGRE	止つ)	

\$LEFT-FIN-A	= 0.0	DOE-2	\$OVERHANG-W	= 0.0	DOE-2
DEFAULT, UNUSED (FT)	<u> </u>	0	DEFAULT, UNUSED (FT)		0
ŞLEFT-FIN-B	= 0.0	DOE-2	\$OVERHANG-D	= 0.0	DOE-2
DEFAULT, UNUSED (FT)			DEFAULT, UNUSED (FT)		
ŞLEFT-FIN-H	= 0.0	DOE-2	\$OVERHANG-ANGLE	= 0.0	DOE-2
DEFAULT, UNUSED(FT)			DEFAULT, UNUSED (DEGR	EES)	
\$LEFT-FIN-D	= 0.0	DOE-2	\$LEFT-FIN-A	= 0.0	DOE-2
DEFAULT, UNUSED (FT)			DEFAULT, UNUSED(FT)		
\$RIGHT-FIN-A	= 0.0	DOE-2	\$LEFT-FIN-B	= 0.0	DOE-2
DEFAULT, UNUSED(FT)			DEFAULT, UNUSED(FT)		
\$RIGHT-FIN-B	= 0.0	DOE-2	\$LEFT-FIN-H	= 0.0	DOE-2
DEFAULT, UNUSED(FT)			DEFAULT, UNUSED(FT)		
\$RIGHT-FIN-H	= 0.0	DOE-2	\$LEFT-FIN-D	= 0.0	DOE-2
DEFAULT, UNUSED(FT)			DEFAULT, UNUSED(FT)		
\$RIGHT-FIN-D	= 0.0	DOE-2	\$RIGHT-FIN-A	= 0.0	DOE-2
DEFAULT, UNUSED (FT)			DEFAULT, UNUSED(FT)		
\$INF-COEF	= 0.0	USED IF	\$RIGHT-FIN-B	= 0.0	DOE-2
INFILTRATION METHOD	=CRACK(0 TO	160)	DEFAULT, UNUSED(FT)		
SKY-FORM-FACTOR	= 0.5	\$ARBITRARY	\$RIGHT-FIN-H	= 0.0	DOE-2
VALUE(0 TO 1)			DEFAULT, UNUSED(FT)		
GND-FORM-FACTOR	= 0.5	\$ARBITRARY	\$RIGHT-FIN-D	= 0.0	DOE-2
VALUE(0 TO 1)			DEFAULT, UNUSED(FT)		
\$SHADING-DIVISIONS	= 10		\$INF-COEF	= 0.0	USED IF
INSIDE-VIS-REFL	= 0.0	\$DOE-2	INFILTRATION METHOD	=CRACK(0 TO 1	L60)
DEFAULT, FOR DAYLIGH	TING CALC(0	то 1)	SKY-FORM-FACTOR	= 0.5	\$ARBITRARY
-,		- ,	VALUE(0 TO 1)		·
DR-4	= DOOR \$ (R	EFERENCED FROM	GND-FORM-FACTOR	= 0.5	ŚARBITRARY
TECC1107 FILE)			VALUE (0 TO 1)		,
WIDTH	= .3		\$SHADING-DIVISIONS	= 10	
HEIGHT	= 7		INSIDE-VIS-REFL	= 0.0	SDOE-2
X	= 22		DEFAILT, FOR DAVIJGH	TTNG CALC(0 1	ro 1)
Y	= 0				
SETBACK = 0 0	0	\$ (ፑጥ)	FLOOR-1	= EXTERIOR-	-WAT.T.
CONSTRUCTION	= DOOR - 1	+ ()	HEIGHT	= 50	
\$MILTTPLIER	=	UNUISED	мтртн	= 100	
SOVERHANG-A	= 0 0	DOF = 2	X X	= 100	
DEFAILT INNIGED (FT)	0.0		ZX V	= 50	
SOVEDUNIC_B	- 0 0	$D \cap \mathbf{F} = 2$	1 7	- 0	
	- 0.0	DOE-2		- 0 - 190	
DEFAULT, UNUSED (FT)			ALIMUTH	- TOO	

CONSTRUCTION = WALL-2 TTTT = 180.0000 .. \$ REFERENCE FROM BUILDING ENERGY SIMULATION VOL. 23, No.6, PAGE 21 WINKELMANN MEMO TOP-1 = EXTERIOR-WALL = 30.39 HEIGHT WIDTH = 104Х = -2 Y = -3.95 Ζ = 6.73 = 180AZIMUTH CONSTRUCTION = ROOF - 1= 17.7400 ... TILT \$ DOE2 DEFAULTS TOP-2 = EXTERIOR-WALL = 36.35 HEIGHT WIDTH = 104Х = 102Υ = 52.25 Ζ = 6.55 = 0 AZIMUTH CONSTRUCTION = ROOF - 1TILT = 32.6200 .. \$ DOE2 DEFAULTS \$---HOURLY REPORTS---\$ PLTSCH = SCHEDULE THRU JAN 14 (ALL) (1,24)(1)THRU AUG 9 (ALL) (1,24) (1) THRU DEC 31 (ALL) (1,24) (1) .. PLOTER1 = REPORT-BLOCKVARIABLE-TYPE = GLOBAL VARIABLE-LIST = (1, 4, 6) .. \$ CLEARNESS NUMBER, DRY BULB TEMPERATURE (°F),

CLOUD AMOUNT (0 TO 10) FROM REFERENCE PT1 TTT.101 PLOTER2 = REPORT-BLOCK VARIABLE-TYPE = BUILDING VARIABLE-LIST = (1, 2, 19, 20, 37).. \$ BUILDING HEATING LOAD (SENSIBLE), BUILDING HEATING LOAD (LATENT), BUILDING COOLING LOAD (SENSIBLE), BUILDING COOLING LOAD (LATENT), BUILDING ELECTRIC TOTAL FROM REFERENCE PT1 III.103 AND III.104 LDS-REP-1 = HOURLY-REPORTREPORT-SCHEDULE = PLTSCHREPORT-BLOCK = (PLOTER1, PLOTER2) OPTION = PRINT ... END .. COMPUTE LOADS .. INPUT SYSTEMS INPUT-UNITS = ENGLISH \$DOE-2 DEFAULT (OR METRIC) OUTPUT-UNITS = ENGLISH ... \$DOE-2 DEFAULT (OR METRIC) SYSTEMS-REPORT SUMMARY = (ALL-SUMMARY) VERIFICATION = (SV-A) REPORT-FREQUENCY = HOURLY HOURLY-DATA-SAVE = NO-SAVE . . \$ SYSTEMS SCHEDULES =DAY-SCHEDULE (1, 24) (1)FAN-1

. .

FAN-2	=DAY-SCHEDULE	(1,24) (1)	COUED		COOL-TEMP-SCH= CO	OL-
FAN-SCHED (WD) FAN-1	=SCHEDULE (WEH) FAN-2	THRU DEC 31	TYPE=REVERS	E-ACTION	THERMOSTAT-	
HEAT-1 HEAT-2 HEAT-WEEK (WEH) HEAT-	=DAY-SCHEDULE =DAY-SCHEDULE =WEEK-SCHEDULE -2 =SCHEDULE	(1,24) (68) (1,24) (68) (MON,FRI) HEAT-1	FROM RUN 3 MULTIPLIER	\$ FOLI SV-A REPORT, \$ DIVI	LOWING AIR FLOWS A	RE
WEEK COOLOFF	=SCHEDULE	THRU DEC 31 (ALL)	SPACE1-1 SIZING-OPTI	=ZONE ON=ADJUST-LOADS	ZONE-AIR=ZAIR	
(1,24) (1) HEATOFF	 =SCHEDULE	THRU DEC 31 (ALL)	CONTROL		ZONE-CONTROL	=
(1,24) (1)			CONDITIONED		ZONE-TYPE	=
COOL-1 COOL-2	=DAY-SCHEDULE =DAY-SCHEDULE	(1,24) (78) (1,24) (78)	0.00	\$ BTU/HR	BASEBOARD-RATING	=
COOL-WEEK (WEH) COOL-	=WEEK-SCHEDULE	(MON, FRI) COOL-1	0.00	\$ BTU/BTU	PANEL-LOSS-RATIO	=
WEEK	=SCHEDULE	THRU DEC 31 COOL-	0.75 \$ FR	AC. OR MULT.	EXHAUS'I'-EFF	=
R1 SUPPLY-LO=52	=DAY-RESET-SCH	SUPPLY-HI=60	OUTDOOR-RES	ET	THROTTLING-RANGE	=
OUTSIDE-HI=	75	OUTSIDE-LO=30	1.00	\$ R	ZONE-FAN-KW/FLOW	=
SAT-RESET R1	=RESET-SCHEDULE	THRU DEC 31 (ALL)	0.0003	\$ KW/CFM	TERMINAL-TYPE	=
	\$ SYSTEM	DESCRIPTION	SVAV		ZONE-REPORTS	=
ZAIR	=ZONE-AIR	OA-CFM/PER=0	S-CONT	=SYSTEM-CONTROL	COOLING-SCHEDUL	.E.=
CONTROL DESIGN-COOL	=ZONE-CONTROL -T=76	DESIGN-HEAT-T=70	COOLOFF		HEATING-SCHEDUL	.E=
SCHED		HEAT-TEMP-SCH= HEAT-	HEATOFF		HEAT-SET-T=65 COOL-CONTROL=RE	SET

		COOL-RESET-		SIZING-RATIO
SCH=SAT-RE	ESET	MIN-SUPPLY-T=60	= 1.00 \$ DOE-2.1 DEFAULT	HEAT-SIZING-RATIO
S-FAN	=SYSTEM-FANS	FAN-SCHEDULE=FAN-	= $1.00 \ \text{$ DOE-2.1 DEFAULT}$ = $1.00 \ \text{$ DOE-2 1 DEFAULT}$	COOL-SIZING-RATIO
		SUPPLY-STATIC=2.0		RETURN-AIR-PATH
SUPPLY-EFI	F=.55	NIGHT-CYCLE-	= DIRECT	HUMIDIFIER-TYPE
CTRL=CYCLE	E-ON-ANY		= ELECTRIC	SHW-HP-SOURCE
S-TERM	=SYSTEM-TERMINAL	REHEAT-DELTA-T=58	= ZONE	
•••		MIN-CFM-RAIIO-0.1	= 100.00 \$ PERCENT	MAX-HOMIDIII
SYST-1	=SYSTEM	SYSTEM-TYPE=VAVS	= 0.00 \$ PERCENT	MIN-HUMIDITY
= 7366		SUPPLY-CFM	= 45 \$ F	PREHEAT-T
= S-CONT		SYSTEM-CONTROL	= 0.00	DESC-CTRL-MODE
- C-FAN		SYSTEM-FANS	- 50.00 \$ 5	DESC-DEW-SET
		SYSTEM-TERMINAL	= 50.00 Ç F	OA-CONTROL
= S-TERM		ECONO-LIMIT-T	= TEMP	SUPPLY-DELTA-T =
= 65		ZONE-NAMES	3.37 \$ R	SUPPLY-KW/FLOW =
= (SPACE1-	-1)	HEAT-SOURCE	0.0011 \$ KW/CFM	MOTOR-PLACEMENT =
= ELECTRIC	C	TONE LEAR COLDCE	IN-AIRFLOW	
= ELECTRIC	C	ZONE-HEAT-SOURCE	DRAW-THROUGH	FAN-PLACEMENI -
= ELECTRIC	C	PREHEAT-SOURCE	1.10 \$ FRAC. OR MULT.	MAX-FAN-RATIO =
= ELECTRI(C	BASEBOARD-SOURCE	0.300 \$ FRAC. OR MULT.	MIN-FAN-RATIO =
- ON		VARIABLE-T		NIGHT-VENT-CTRL =
- 010			UCT AVALLANA ION	

=

5.0 \$ R	NIGHT-VENT-DT =	VARIABLE-LIST = (8) \$ DRY BULB TEMPERATURE (°F) FROM SUPLEMENT PAGE A.16
	RATED-CCAP-FFLOW	
= SDL-C80	COOL-CAP-FT	PLOTER4 = REPORT-BLOCK VARIABLE-TYPE = PLANT1
= SDL-C7	COOL-SH-FT	VARIABLE-LIST = (1, 2, 3) \$ TOTAL COOLING LOAD (Btu/hr), TOTAL HEATING LOAD
= SDL-C27	COIL DE	(Btu/hr), TOTAL ELECTRICAL LOAD (Kw) FROM
= 0.0370 \$ FRAC. OR MULT.	COIL-Br	SUPLEMENT PAGE A.40
= SDL-C37	COIL-BF-FFLOW	LDS-REP-2 = HOURLY-REPORT REPORT-SCHEDULE = PLTSCH2
	COIL-BF-FT	REPORT-BLOCK = (PLOTER3, PLOTER4)
= SDL-C47		OPTION = PRINT
PLANT1 = PLANT-ASSIGNMENT (SYST-1) \$ REFERENCE FROM THE	SYSTEM-NAMES = IECC1107 FILE	END COMPUTE SYSTEMS INDUT DIANT INDUT-UNITS - ENCLISH
ELECTRIC	DAW-IIFE -	\$DOE-2 DEFAULT (OR METRIC)
DHWSCH-1	DHW-SCH =	OUTPUT-UNITS = ENGLISH \$DOE-2 DEFAULT(OR METRIC)
0.03472 \$CALCULATED FROM MANUAL PAGE 7-14	DHW-GAL/MIN = ASHRAE 90.1 USER'S	PLANT1 = PLANT-ASSIGNMENT
		PLANT-REPORT SUMMARY=(PS-A, PS-E,
DHWSCH-1 = SCHEDULE THRU JAN (1)	N 14 (ALL) (1,24)	BEPS)
THRU AUG THRU DEC	9 (ALL) (1,24) (1) 31 (ALL) (1,24)	\$ EQUIPMENT DESCRIPTION
(1)		\$ HOT-WATER BOILER
PLTSCH2 = SCHEDULE THRU JAN (1)	14 (ALL) (1,24)	SBOIL1 =PLANT-EQUIPMENT TYPE=HW-BOILER SIZE=-999 \$ AUTOSIZE
THRU AUG THRU DEC (1)	9 (ALL) (1,24) (1) 31 (ALL) (1,24)	PLANT-PARAMETERS HERM-REC-COND- TYPE=AIR
PLOTER3 = REPORT-BLOCK VARIABLE-TYPE = GLOP	BAL	\$ AIR-COOLED RECIPROCATING CHILLER

		\$ SPONSOR:	National Science
CHIL1 =PLANT-EQUIP	MENT TYPE=HERM-REC-CHLR	Foundation	
SIZE=-999 \$ AUTOSI	IZE	\$	
		\$ COPYRIGHT	: NSF, 2010.
PLANT-COSTS PRO	JECT-LIFE=25 DISCOUNT-	\$	
RATE=5		\$	
ENERGY-RESOURCE RESO	OURCE=ELECTRICITY	\$ DEVELOPER	(PI) MARK J CLAYTON
ENERGY-RESOURCE RESO	OURCE=NATURAL-GAS	\$	Professor
ENERGY/UNIT=100000		\$	Department of
UNI!	I-NAME=THERMS	Architecture	
		Ś	Texas A&M
END		University, Colleg	ge Station, T
COMPUTE PLANT		Ś	PHONE: $(979) 845 - 2300$
STOP		Ś	1110112. (3737010 2000
5101		Ś	(CO-PI) JEFE HABERI
		Ph D. P F.	
		Ś	Professor
		Ś	Department of
		Architecture	
		\$	Fneray Systems
		y Laboratory	Energy bystems
		Ś	Toyas J.M
This is the input file for Hou	ston that uses SYSTEM-	university Colle	a Station T
TYPE=SUM		e correction correction	DUONE. (070) 945 6065
STYPE OF BUILDING		ද ද	PHONE: (979)843-6065
SSAMPLE1E-RUN3A WITH N	MODIFICATION	2 Č	(Co DI) WEI VAN
STEST CASE ONE SIX ZOI	VE MODEL	२ ¢	(CO-PI) WEI IAN
		2 2	Assistant Professor
SETLE NAME = 01A1 INP		γ	Department of
OTTLE NAME - OTAL.INI		Architecture	T P A Y
		\$	'l'exas A&M
*****	* * * * * * * * * * * * * * * * * * * *	University, Collect	ge Station, T
++++++++++++++++++++++++++++++++++++	****	Ş	PHONE: (979)845-0584
Ć DDOCDIM-		Ş	
PROGRAM:	DOE-2 SIMULATION	\$ STUDENTS	: JOSE LUIS BERMUDEZ
INPUT FILE		ALCOCER	
		Ş	Ph.D. student
> LANGUAGE:	DOE-Z.IE BDL VERSION	\$	Department of
110		Architecture	
Ş			

\$	Texas A&M	\$!	
University, College Station	г, Т	!		
\$		\$!	
\$	SANDEEP KOTA	!		
\$	Ph.D. student	\$!	
\$	Department of	!		
Architecture		\$!	
\$	Texas A&M	!		
University, College Station	а, Т	\$ I	!	
Ś	JONG BUM KIM	ŝ	1	SPACE1-1
Ś	Ph.D. student	1		0111021 1
Ś	Department of	· S	1	
Architecture		+	•	
Ś	Texas A&M	· S	1	
University, College Station		1		
\$	- / -	ŝ	1	
Ś	WOONSEONG JEONG	1		
Ś	Ph.D. student	Ś	!	
Ś	Department of	1		
Architecture		Ş	!	
\$	Texas A&M	1		
University, College Station	г. Т	Ś	!	
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`\$**********************	****	Ş	!	
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		1		
		\$		
\$				
		INPUT LOADS INPU	JT-UNITS = ENGLISH	\$DOE-2
Ş !		DEFAULT (OR METRIC	2)	
		OUTE	PUT-UNITS = ENGLISH	. \$DOE-2
\$!		DEFAULT (OR METRIC	2)	
1				
\$!		TITLE		
!		LINE-1 *NSF PROJE LINE-2 *TEST CASE	SCT * S-1 *	

LINE-3 *ONE-2	CONE MODEL*		
RUN-PERIOD	JAN 14 2010 THRU AUG 9 2010 THRU A JAN 1 2010 THRU	JAN 14 2010 UG 9 2010 DEC 31 2010	0=north,
			•
ABORT DIAGNOSTIC	ERRORS DEFAULTS	\$ ADDED	0=CLEAR,
COMMAND TO PF	NINT ALL THE DEFAUL	TS	0=SUMMER
LOADS-REPORT SUMMARY = (7	ALL-SUMMARY)	Ŝ ADDED	0.5 TO 1
COMMAND TO PE	RINT ALL THE LOADS	SUMMARY REPORTS	FROM REF
COMMAND TO PE	RINT ALL THE LOADS	VERIFICATION	SUMMER1= Arbitrar
REPORT-FREQUE	ENCY = HOURLY	\$ DEFAULTS	111(2) 1 1 1 1 1 1
HOURLY-DATA-S	SAVE = NO-SAVE	\$ DEFAULTS	
\$*********** Davq*********	**************************************	ESIGN ****	
	TCM DAVE EDOM TECC	1107 EILE DOV	0=NORTH,
BULB AND DEW	POINT TEMPERATURES	FROM 1993 ASHRAE	0=CLEAR,
			0=SUMMER
WINTER1=DESIG ARBITRARY	GN-DAY	\$ ALL VALUES	0.5 TO 1
DRY	(BULB-HI= 32	\$ (DEG F)	
DR) HOI	(BULB-LO= 32 IR-HI= 13	S (DEG F) S (HOURS)	REFERENC
HOU	JR-LO=1	\$ (HOURS)	\$ *****
DEV	VPT-HI= 19	\$ (DEG F)	BUILDING

	DEWPT-LO= 19	\$	(DEG F	')
	DHOUR-HI= 15	\$, (HOURS	5)
	DHOUR-LO=3	\$, (HOURS	5)
	WIND-SPEED= 7	\$	(KNOTS	5)
	WIND-DIR= 15		\$,
)=NORTH,1=	=NNE			
· · · ·	CLOUD-AMOUNT= 0	\$		
)=CLEAR,10)=OVERCAST			
	CLOUD-TYPE= 1	\$		
)=SUMMER,2	2=FALL/SPRING,1=WINTER			
	CLEARNESS= 0.6	\$	VARIES	FROM
О.5 TO 1.2				
	GROUND-T= 77	\$	(DEG F	')
FROM REFEF	RENCE PART II PAGE VIII.93	3	,	
SUMMER1=DE	ESIGN-DAY	\$	ALL VA	LUES
ARBITRARY				
	DRYBULB-HI= 94	\$	(DEG F)	
	DRYBULB-LO= 94	\$	(DEG F)	
	HOUR-HI= 13	\$	(HOURS)	
	HOUR-LO= 3	\$	(HOURS)	
	DEWPT-HI= 77	\$	(DEG F)	
	DEWPT-LO= 77	\$	(DEG F)	
	DHOUR-HI= 15	\$	(HOURS)	
	DHOUR-LO= 5	\$	(HOURS)	
	WIND-SPEED= 5	\$	(KNOTS)	
	WIND-DIR= 8	\$		
)=NORTH,1=	=NNE			
	CLOUD-AMOUNT= 0	\$		
)=CLEAR,10)=OVERCAST			
	CLOUD-TYPE= 0	\$		
)=SUMMER,2	2=FALL/SPRING,1=WINTER			
	CLEARNESS= 0.6	\$	VARIES	FROM
О.5 ТО 1.2	2			
	GROUND-T= 81	\$	(DEG F)	FROM
REFERENCE	PART II PAGE VIII.93			

Texas A&M University

\$ THE LOCATION INFORMATION LATITUDE/ LONGITUDE
AND ALTITUDE HAVE BEEN CHANGED FROM SAMP1E RUN3A
TO RUN THE SIMULATION FOR THE
\$ HOUSTON WEATHER FILE.

BUILDING-LOCATION \$ BUILDING LOCATION INPUT COMMAND LATITUDE = 29.65 \$ LATITUDE FOR CITY OF HOUSTON = 95.28\$ LONGITUDE FOR LONGITUDE CITY OF HOUSTON = 108.00 \$ ALTITUDE FOR ALTITUDE CITY OF HOUSTON HOLIDAY = YES \$ DOE-2.1E DEFAULT FOR HOLIDAYS = YES (USA-NATIONAL HOLIDAYES) TIME-ZONE = 6 \$ TIME ZONE FOR THE CITY OF HOUSTON AZIMUTH = 0 \$ BUILDING AZIMUTH / SAMP1E RUN 3A AZIMUTH = 30/ TESTCASE= 0 DAYLIGHT-SAVINGS = YES \$ OPTIONS FOR DAYLIGHT SAVINGS DOE-2.1E DEFAULTS=YES GROSS-AREA = 5000 \$ GROSS FLOOR AREA OF THE CONDITIONED SPACE OF THE BUILDING HEAT-PEAK-PERIOD = (1, 24) \$ DOE-2.1E DEFAULT UNUSED = (1, 24) \$ DOE-2.1E COOL-PEAK-PERIOD DEFAULT UNUSED ATM-MOISTURE) \$ UNUSED DOE-21.E DEFAULTS CALCULATED HOURLY FROM DEWPOINT

ATM-TURBIDITY = (0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.112, 0.12, 0.12)\$ UNUSED DOE-21.E DEFAULTS USED IF WEATHER FILE DO NOT HAVE SOLAR DATA = 0.0000 \$ UNUSED DOE-X-REF 21.E DEFAULTS CORDINATES TO TRANSLATE BUILDING LOCATION Y-REF = 0.0000 \$ UNUSED DOE-21.E DEFAULTS CORDINATES TO TRANSLATE BUILDING LOCATION SHIELDING-COEF = 0.2400 \$ DOE-2 DEFAULT, THIS COEFFICIENT USED IN SHERMAN GRIMSRUD INFILTRATION METHOD

TERRAIN-PAR1 = 0.8500 \$ DOE-2 DEFAULT IS A CONSTANT. USED TO MODIFY THE FREE STREAM WIND SPEED TO ACCOUNT FOR GROUND ROUGHNESS AND HEIGHT ABOVE GROUND LEVEL AT THE BUILDING SITE TERRAIN-PAR2 = 0.2000 \$ DOE-21.E DEFAULTS IS A CONSTANT USED TO MODIFY THE FREE STREAM WIND SPEED TO ACCOUNT FOR GROUND ROUGHNESS AND HEIGHT ABOVE GROUND LEVEL AT THE BUILDING SITE.

WS-TERRAIN-PAR1 = 1.0000 \$ DOE-21.E DEFAULTS IS A CONSTANT CORRESPONDING TO TERRAIN-PART1, BUT FOR THE LOCATION OF THE WIND SPEED MEASUREMENT; I.E., THE WEATHER STATION. WS-TERRAIN-PAR2 = 0.1500 \$ UNUSED DOE-21.E DEFAULTS IS A CONSTANT CORRESPONDING TO TERRAIN-PART2, BUT FOR THE LOCATION OF THE WIND SPEED MEASUREMENT; I.E., THE WEATHER STATION. WS-HEIGHT-LIST = (33.0) \$ DOE-21.E DEFAULTS SOLAR-REFL-CALC = NO-CALC \$ DOE-21.E DEFAULTS

TEMP BY

91

SURF-TEMP-CALC = NO ... B-SH-1 =SCHEDULE thru jan 1 (ALL) (1,24)(1) THRU DEC 31 (ALL) (1,24)(1) ... \$ BUILDING SHADES (REFERENCE FROM IECC1107.INP FILE) \$ BD1 = BUILDING-SHADE X = 0 Y = 0 Z = 0\$COORDINATES HEIGHT = 10.0\$(FT) WIDTH = 5.0\$(FT) AZIMUTH = 90\$(DEGREES) TRANSMITTANCE = 0.0\$(0 TO 1), DOE-2 DEFAULT = 0.9 TILT = 90(DEGREES), DEFAULT = 90SHADE-SCHEDULE = B-SH-1 .. \$ SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING BD2 = BUILDING-SHADEX = 0 Y = 45 Z = 0\$COORDINATES HEIGHT = 10.0\$(FT) WIDTH = 5.0\$(FT) AZIMUTH = 90\$(DEGREES)

TRANSMITTANCE = 0.0\$(0 TO 1), DOE-2 DEFAULT = 0.9 TILT = 90(DEGREES), DEFAULT = 90SHADE-SCHEDULE = B-SH-1 .. \$ SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING BD3 = BUILDING-SHADEX = 20 Y = 0 Z = 0\$COORDINATES HEIGHT = 10.0\$(FT) WIDTH = 5.0\$(FT) AZIMUTH = 90\$(DEGREES) \$(0 TRANSMITTANCE = 0.0TO 1), DOE-2 DEFAULT = 0.9 TILT = 90(DEGREES), DEFAULT = 90SHADE-SCHEDULE = B-SH-1 .. \$ SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING BD4 = BUILDING-SHADEX = 20 Y = 45 Z = 0\$COORDINATES HEIGHT = 10.0\$(FT) WIDTH = 5.0\$(FT) AZIMUTH = 90\$(DEGREES) \$(0 TRANSMITTANCE = 0.0TO 1), DOE-2 DEFAULT = 0.9 TILT = 90(DEGREES), DEFAULT = 90SHADE-SCHEDULE = B-SH-1 .. \$ SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING

BD5 = BUILDING-SHADE

X = 40 Y = 0 Z = 0	
\$COORDINATES	
HEIGHT = 10.0	\$(FT)
WIDTH = 5.0	\$(FT)
AZIMUTH = 90	
\$(DEGREES)	
TRANSMITTANCE = 0.0	\$(0
TO 1), $DOE-2$ DEFAULT = 0.9	
TILT = 90	
(DEGREES), DEFAULT = 90	
SHADE-SCHEDULE = B-SH-1	\$
SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE	
COMMANDS ARE USED FOR DAYLIGHTING	
BD6 = BUILDING-SHADE	
$X = 40 \ Y = 45 \ Z = 0$	
\$COORDINATES	
HEIGHT = 10.0	\$(FT)
WIDTH = 5.0	\$(FT)
AZIMUTH = 90	
\$(DEGREES)	
TRANSMITTANCE = 0.0	\$(0
TO 1), $DOE-2$ DEFAULT = 0.9	
TILT = 90	
(DEGREES), DEFAULT = 90	
SHADE-SCHEDULE = B-SH-1	\$
SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE	
COMMANDS ARE USED FOR DAYLIGHTING	
BD7 = BUILDING-SHADE	
X = 60 Y = 0 Z = 0	
\$COORDINATES	
HETGHT = 10.0	\$(FT)
WIDTH = 5.0	\$(FT)
A7.TMUTH = 90	1 ()
\$ (DEGREES)	
TRANSMITTANCE = 0.0	\$(0
TO 1), $DOE-2$ DEFAULT = 0.9	

TILT = 90(DEGREES), DEFAULT = 90SHADE-SCHEDULE = B-SH-1 .. \$ SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING BD8 = BUILDING-SHADE X = 60 Y = 45 Z = 0\$COORDINATES \$(FT) HEIGHT = 10.0WIDTH = 5.0\$(FT) AZIMUTH = 90\$(DEGREES) \$(0 TRANSMITTANCE = 0.0TO 1), DOE-2 DEFAULT = 0.9 TILT = 90(DEGREES), DEFAULT = 90SHADE-SCHEDULE = B-SH-1 .. \$ SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING BD9 = BUILDING-SHADEX = 80 Y = 0 Z = 0\$COORDINATES HEIGHT = 10.0\$(FT) WIDTH = 5.0\$(FT) AZIMUTH = 90\$(DEGREES) \$(0 TRANSMITTANCE = 0.0TO 1), DOE-2 DEFAULT = 0.9 TILT = 90(DEGREES), DEFAULT = 90SHADE-SCHEDULE = B-SH-1 ... \$ SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING BD10 = BUILDING-SHADE X = 80 Y = 45 Z = 0

```
$COORDINATES
```

HEIGHT = 10.0 $WIDTH = 5.0$ $AZIMUTH = 90$	\$ (FT) \$ (FT)
\$ (DEGREES)	
TRANSMITTANCE = 0.0	\$(0
TO 1), $DOE-2$ DEFAULT = 0.9	
TILT = 90	
(DEGREES), DEFAULT = 90	
SHADE-SCHEDULE = B-SH-1	\$
SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE	
COMMANDS ARE USED FOR DAYLIGHTING	
BD11 = BUILDING-SHADE	
X = 100 Y = 0 Z = 0	
\$COORDINATES	
HEIGHT = 10.0	\$ (FT)
WIDTH = 5.0	Ş(E'T)
AZIMUTH = 90	
γ (DEGREES) TRANSMITTANCE - 0 0	\$ (0
TO 1), DOE-2 DEFAULT = 0.9	Ϋ(Ο
TTLT = 90	
(DEGREES), DEFAULT = 90	
SHADE-SCHEDULE = B-SH-1.	\$
SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE	,
COMMANDS ARE USED FOR DAYLIGHTING	
BD12 = BUILDING-SHADE	
$X = 100 \ Y = 45 \ Z = 0$	
\$COORDINATES	
HEIGHT = 10.0	\$(FT)
WIDTH $= 5.0$	\$(FT)
AZIMUTH = 90	
\$(DEGREES)	
TRANSMITTANCE = 0.0	Ş(O
TO 1), $DOE-2$ DEFAULT = 0.9	
I'ILLI' = 90	
Ş(DEGREES),DEFAULT = 90	

SHADE-SCHEDULE = B-SH-1 .. \$ SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING BD13 = BUILDING-SHADE X = 0 Y = 0 Z = 18.5\$COORDINATES HEIGHT = 24\$(FT) WIDTH = 4\$(FT) AZIMUTH = 180\$(DEGREES) \$(0 TRANSMITTANCE = 0.0TO 1), DOE-2 DEFAULT = 0.9 TILT = 17.74(DEGREES), DEFAULT = 90SHADE-SCHEDULE = B-SH-1 .. \$ SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING BD14 = BUILDING-SHADE X = 8 Y = 0 Z = 18.5\$COORDINATES \$(FT) HEIGHT = 24WIDTH = 4\$(FT) AZIMUTH = 180\$(DEGREES) TRANSMITTANCE = 0.0\$(0 TO 1), DOE-2 DEFAULT = 0.9 TILT = 17.74(DEGREES), DEFAULT = 90SHADE-SCHEDULE = B-SH-1 .. \$ SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING BD15 = BUILDING-SHADE X = 12 Y = 0 Z = 18.5\$COORDINATES HEIGHT = 24\$(FT)

August 2012

SHADE-SCHEDULE = B-SH-1 .. \$ SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING BD18 = BUILDING-SHADE X = 24 Y = 0 Z = 18.5\$COORDINATES HEIGHT = 24\$(FT) WIDTH = 4\$(FT) AZIMUTH = 180\$(DEGREES) TRANSMITTANCE = 0.0\$(0 TO 1), DOE-2 DEFAULT = 0.9 TILT = 17.74(DEGREES), DEFAULT = 90SHADE-SCHEDULE = B-SH-1 .. \$ SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING BD19 = BUILDING-SHADEX = 28 Y = 0 Z = 18.5\$COORDINATES HEIGHT = 24\$(FT) WIDTH = 4\$(FT) AZIMUTH = 180\$(DEGREES) \$(0 TRANSMITTANCE = 0.0TO 1), DOE-2 DEFAULT = 0.9 TILT = 17.74(DEGREES), DEFAULT = 90SHADE-SCHEDULE = B-SH-1 ... \$ SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING BD20 = BUILDING-SHADE X = 32 Y = 0 Z = 18.5

\$COORDINATES

HEIGHT = 24\$(FT) \$(FT) WIDTH = 4AZIMUTH = 180\$(DEGREES) TRANSMITTANCE = 0.0\$(0 TO 1), DOE-2 DEFAULT = 0.9 TILT = 17.74(DEGREES), DEFAULT = 90SHADE-SCHEDULE = B-SH-1 .. Ŝ SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING BD21 = BUILDING-SHADE X = 36 Y = 0 Z = 18.5\$COORDINATES HEIGHT = 24\$(FT) WIDTH = 4\$(FT) AZIMUTH = 180\$(DEGREES) \$(0 TRANSMITTANCE = 0.0TO 1), DOE-2 DEFAULT = 0.9 TILT = 17.74(DEGREES), DEFAULT = 90SHADE-SCHEDULE = B-SH-1 ... \$ SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING BD22 = BUILDING-SHADE X = 40 Y = 0 Z = 18.5**\$COORDINATES** HEIGHT = 24\$(FT) WIDTH = 4\$(FT) AZIMUTH = 180\$(DEGREES) \$(0 TRANSMITTANCE = 0.0TO 1), DOE-2 DEFAULT = 0.9

TILT = 17.74(DEGREES), DEFAULT = 90SHADE-SCHEDULE = B-SH-1 .. \$ SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING BD23 = BUILDING-SHADE X = 44 Y = 0 Z = 18.5\$COORDINATES HEIGHT = 24\$(FT) WIDTH = 4\$(FT) AZIMUTH = 180\$ (DEGREES) TRANSMITTANCE = 0.0\$(0 TO 1), DOE-2 DEFAULT = 0.9 TILT = 17.74(DEGREES), DEFAULT = 90SHADE-SCHEDULE = B-SH-1 ... \$ SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING BD24 = BUILDING-SHADE X = 48 Y = 0 Z = 18.5\$COORDINATES HEIGHT = 24\$(FT) WIDTH = 4\$(FT) AZIMUTH = 180\$(DEGREES) \$(0 TRANSMITTANCE = 0.0TO 1), DOE-2 DEFAULT = 0.9 TILT = 17.74(DEGREES), DEFAULT = 90SHADE-SCHEDULE = B-SH-1 ... \$ SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING

BD25 = BUILDING-SHADE

X = 52 Y = 0 Z = 18.5\$COORDINATES HEIGHT = 24\$(FT) WIDTH = 4\$(FT) AZIMUTH = 180\$(DEGREES) TRANSMITTANCE = 0.0\$(0 TO 1), DOE-2 DEFAULT = 0.9 TILT = 17.74(DEGREES), DEFAULT = 90SHADE-SCHEDULE = B-SH-1 .. Ŝ SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING BD26 = BUILDING-SHADEX = 56 Y = 0 Z = 18.5\$COORDINATES HEIGHT = 24\$(FT) WIDTH = 4\$(FT) AZIMUTH = 180\$(DEGREES) TRANSMITTANCE = 0.0\$(0 TO 1), DOE-2 DEFAULT = 0.9 TILT = 17.74(DEGREES), DEFAULT = 90SHADE-SCHEDULE = B-SH-1 .. \$ SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING BD27 = BUILDING-SHADEX = 60 Y = 0 Z = 18.5\$COORDINATES HEIGHT = 24\$(FT) WIDTH = 4\$(FT) AZIMUTH = 180\$(DEGREES)

TRANSMITTANCE = 0.0\$(0 TO 1), DOE-2 DEFAULT = 0.9 TILT = 17.74(DEGREES), DEFAULT = 90SHADE-SCHEDULE = B-SH-1 .. \$ SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING BD28 = BUILDING-SHADE X = 64 Y = 0 Z = 18.5\$COORDINATES HEIGHT = 24\$(FT) WIDTH = 4\$(FT) AZIMUTH = 180\$(DEGREES) TRANSMITTANCE = 0.0\$(0 TO 1), DOE-2 DEFAULT = 0.9 TILT = 17.74(DEGREES), DEFAULT = 90SHADE-SCHEDULE = B-SH-1 .. \$ SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING BD29 = BUILDING-SHADEX = 68 Y = 0 Z = 18.5\$COORDINATES HEIGHT = 24\$(FT) WIDTH = 4\$(FT) AZIMUTH = 180\$ (DEGREES) \$(0 TRANSMITTANCE = 0.0TO 1), DOE-2 DEFAULT = 0.9 TILT = 17.74(DEGREES), DEFAULT = 90\$ SHADE-SCHEDULE = B-SH-1 ... SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING

BD30 = BUILDING-SHADE X = 72 Y = 0 Z = 18.5\$COORDINATES HEIGHT = 24\$(FT) WIDTH = 4\$(FT) AZIMUTH = 180\$(DEGREES) TRANSMITTANCE = 0.0\$(0 TO 1), DOE-2 DEFAULT = 0.9 TILT = 17.74(DEGREES), DEFAULT = 90SHADE-SCHEDULE = B-SH-1 ... SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING BD31 = BUILDING-SHADE X = 76 Y = 0 Z = 18.5\$COORDINATES HEIGHT = 24\$(FT) WIDTH = 4\$(FT) AZIMUTH = 180\$(DEGREES) TRANSMITTANCE = 0.0\$(0 TO 1), DOE-2 DEFAULT = 0.9 TILT = 17.74(DEGREES), DEFAULT = 90SHADE-SCHEDULE = B-SH-1 ... \$ SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING BD32 = BUILDING-SHADE X = 80 Y = 0 Z = 18.5\$COORDINATES HEIGHT = 24\$(FT) WIDTH = 4\$(FT)

AZIMUTH = 180\$(DEGREES) \$(0 TRANSMITTANCE = 0.0TO 1), DOE-2 DEFAULT = 0.9 TILT = 17.74(DEGREES), DEFAULT = 90SHADE-SCHEDULE = B-SH-1 .. \$ SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING BD33 = BUILDING-SHADE X = 84 Y = 0 Z = 18.5\$COORDINATES HEIGHT = 24\$(FT) WIDTH = 4\$(FT) AZIMUTH = 180\$(DEGREES) TRANSMITTANCE = 0.0\$(0 TO 1), DOE-2 DEFAULT = 0.9 TILT = 17.74(DEGREES), DEFAULT = 90SHADE-SCHEDULE = B-SH-1 .. \$ SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING BD34 = BUILDING-SHADE X = 88 Y = 0 Z = 18.5\$COORDINATES HEIGHT = 24\$(FT) \$(FT) WIDTH = 4AZIMUTH = 180\$(DEGREES) TRANSMITTANCE = 0.0\$(0 TO 1), DOE-2 DEFAULT = 0.9 TILT = 17.74(DEGREES), DEFAULT = 90

SHADE-SCHEDULE = B-SH-1 SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT,THESE COMMANDS ARE USED FOR DAYLIGHTING	\$	*** *** \$
		**
BD35 = BUILDING-SHADE		*
X = 92 Y = 0 Z = 18.5		**:
SCOORDINATES		č
$\frac{\text{nLIGnI}}{\text{S}(\text{FT})}$		₽ **:
WIDTH = 4	\$(FT)	**
AZIMUTH = 180		**
\$(DEGREES)		
TRANSMITTANCE = 0.0	\$(0	
TO 1), $DOE-2$ DEFAULT = 0.9		\$
TILT = 17.74		**:
S (DEGREES), DEFAULT = 90	Ċ	***
SHADE-SCHEDULE - D-SH-I SHADE-VIS-REFL = 0 5 DOE-2 DEFAULT THESE	Ş	S
COMMANDS ARE USED FOR DAYLIGHTING		↔ **:
		**:
BD36 = BUILDING-SHADE		**:
X = 96 Y = 0 Z = 18.5		* * '
\$COORDINATES		\$
HEIGHT = 24		**:
Ş (FT)		**:
WIDTH = 4	Ş(FT)	~ ~ `
S (DECREES)		BII
TRANSMITTANCE = 0.0	\$(0	DO
TO 1), $DOE-2$ DEFAULT = 0.9		LI
TILT = 17.74		TH
\$(DEGREES),DEFAULT = 90		COI
SHADE-SCHEDULE = B-SH-1	\$	\$(]
SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE		DEI
COMMANDS ARE USED FOR DAYLIGHTING		SPI
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* BUILDING DESCRIPTION	
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***** MATERIALS

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BUILTUP-ROOFING-MAT = MATERIAL \$ DOE2.1E(REFERENCE 2ND PART X.B.2 MATERIALS LIBRARY) THICKNESS = 0.0313 \$(FT) CONDUCTIVITY = 0.0939 \$(BTU.FT/HR.FT^2.F) DENSITY = 70 \$(LB/FT^3) SPECIFIC-HEAT = 0.35 .. \$(BTU/LB.F)

ROOF-GRAVEL-MAT = MATERIAL \$ DOE2.1E(REFERENCE 2ND PART X.B.7 MATERIALS LIBRARY) THICKNESS = 0.0417\$(FT) CONDUCTIVITY CONDUCTIVITY = 0.834DENSITY \$(BTU.FT/HR.FT^2.F) DENSITY = 55 \$(LB/FT^3) SPECIFIC-HEAT = 0.4 .. \$(BTU/LB.F) POLY-EXP = MATERIAL \$ DOE2.1E(4 in. FROM REFERENCE 2ND PART X.B.9 MATERIALS RESISTANCE LIBRARY) THICKNESS = 0.4166 \$(FT) CONDUCTIVITY = 0.02 \$(BTU.FT/HR.FT^2.F) = 1.8 \$(LB/FT^3) DENSITY SPECIFIC-HEAT = 0.29 .. \$(BTU/LB.F) PAPER RESISTANCE BRICK-4" = MATERIAL \$ DOE2.1E (FROM REFERENCE 2ND PART X.B.2 MATERIALS LIBRARY) THICKNESS = 0.3333\$(FT) = 0.4167CONDUCTIVITY THICKNESS \$(BTU.FT/HR.FT^2.F) \$(LB/FT^3) DENSITY = 120SPECIFIC-HEAT = 0.2 \$(BTU/LB.F) DENSITY . . MIN-WOOL-FIB = MATERIAL \$ DOE2.1E(FROM REFERENCE 2ND PART X.B.9 MATERIALS SOFT-WOOD LIBRARY) = 0.2957\$ BATT, R-11 THICKNESS LIBRARY) CONDUCTIVITY = 0.0250THICKNESS \$(BTU.FT/HR.FT^2.F) DENSITY = 0.60 \$(LB/FT^3) = 0.2 .. SPECIFIC-HEAT \$(BTU/LB.F) DENSITY GYPSUM = MATERIAL \$ DOE2.1E (HOLLOW GYPSUM BOARD FROM REFERENCE 2ND SOIL-12IN PART X.B.6 MATERIALS LIBRARY) THICKNESS = 0.0417\$(FT) THICKNESS

= 0.0926\$(BTU.FT/HR.FT^2.F) = 49.0 \$(LB/FT^3) SPECIFIC-HEAT = 0.2 .. \$(BTU/LB.F) AIR-LAYER-HALF-INCH = MATERIAL \$ DOE2.1E(AIR LAYER, ³/₄ IN. OR LESS FOR VERTICAL WALLS FROM REFERENCE 2ND PART X.B.11 MATERIALS LIBRARY) = 0.9 ... \$(HR.FT^2.F/BTU) PLASTIC-FILM-SEAL = MATERIAL \$ DOE2.1E (BUILDING PAPER TYPE FROM REFERENCE 2ND PART X.B.2 MATERIALS LIBRARY) REPRESENTING TAR-= 0.01 ... \$(HR.FT^2.F/BTU) PLYWOOD-HALF-INCH = MATERIAL \$ DOE2.1E(FROM REFERENCE 2ND PART X.B.7 MATERIALS LIBRARY) = 0.0417\$(FT) CONDUCTIVITY = 0.0667\$(BTU.FT/HR.FT^2.F) = 34.0 \$(LB/FT^3) SPECIFIC-HEAT = 0.29 .. \$(BTU/LB.F) = MATERIAL \$ DOE2.1E(3/4 IN. FROM REFERENCE 2ND PART X.B.8 MATERIALS = 0.0625 \$(FT) = 0.0667CONDUCTIVITY \$(BTU.FT/HR.FT^2.F) = 34 \$(LB/FT^3) SPECIFIC-HEAT = 0.33 .. \$(BTU/LB.F) = MATERIAL \$ SOIL LAYER (FROM BUILDING ENERGY SIMULATION VOL. 23, No.6, PAGES 21-22 WINKELMANN MEMO) = 1.0\$(FT)

CONDUCTIVITY = 1.0SPECIFIC-HEAT \$(BTU.FT/HR.FT^2.F) \$(LB/FT^3) DENSITY = 115 SPECIFIC-HEAT = 0.1 ... \$(BTU/LB.F) CONCRETE-HE-WEIGHT = MATERIAL \$ DOE2.1E(4 IN., DRIED AGGREGATE, 140 LB. FROM REFERENCE 2ND PART X.B.3 MATERIALS LIBRARY) THICKNESS = 0.33\$(FT) DENSITY CONDUCTIVITY = 0.7576\$(BTU.FT/HR.FT^2.F) DENSITY = 140.0\$(LB/FT^3) SPECIFIC-HEAT = 0.2 .. \$(BTU/LB.F) CONCRETE-BLOCK-8" = MATERIAL Ś DOE2.1E (CONCRETE FILLED FROM REFERENCE 2ND PART X.B.6 MATERIALS LIBRARY) THICKNESS = 0.6667\$(FT) DENSITY CONDUCTIVITY = 0.4359\$(BTU.FT/HR.FT^2.F) = 115.0\$(LB/FT^3) Ś DENSITY SPECIFIC-HEAT = 0.2 ... \$(BTU/LB.F) CONCRETE-LI-WEIGHT = MATERIAL \$ DOE2.1E(4 IN., 80 LB. FROM REFERENCE 2ND PART X.B.5 Ś MATERIALS LIBRARY) = 0.33THICKNESS \$(FT) CONDUCTIVITY = 0.2083\$(BTU.FT/HR.FT^2.F) DENSITY = 80.0 \$(LB/FT^3) \$(BTU/LB.F) SPECIFIC-HEAT = 0.2 ... POLY-EXP-2 = MATERIAL \$ DOE2.1E(4 in. FROM REFERENCE 2ND PART X.B.9 MATERIALS WA - 1 - 2LIBRARY) THICKNESS = 0.3333\$(FT) = 0.02CONDUCTIVITY \$(BTU.FT/HR.FT^2.F) DENSITY = 1.8 4", PLASTIC-FILM-SEAL, \$(LB/FT^3)

MINERAL-WOOL1 = MATERIAL \$DOE2.1E (MATERIALS LIBRARY, REFERENCED FROM IECC1107 FILE) THICKNESS = 0.2917\$(FT) CONDUCTIVITY = 0.027\$(BTU.FT/HR.FT^2.F) = 0.6 \$(LB/FT^3) SPECIFIC-HEAT = 0.2 .. \$(BTU/LB.F) SOFT-WOOD1 = MATERIAL \$DOE2.1E (MATERIALS LIBRARY, REFERENCED FROM IECC1107 FILE) THICKNESS = 0.2083\$(FT) = 0.0667CONDUCTIVITY \$(BTU.FT/HR.FT^2.F) = 32 \$(LB/FT^3) SPECIFIC-HEAT = 0.33 .. \$(BTU/LB.F) ************************* LAYERS ***** = LAYERS \$ LAYERS FOR THE EXTERIOR WALL CONSTRUCTION INSIDE-FILM-RES = 0.6800\$ HR-SOFT-F /BTU (REFERENCE FROM IECC1107) MATERTAL = (AIR-LAYER-HALF-INCH, BRICK-

= 0.29 . \$(BTU/LB.F)

PLYWOOD-HALF-INCH, MIN-WOOL-FIB, GYPSUM, AIR-LAYER-HALF-INCH).. \$ MATERIALS FROM OUTSIDE TO INSIDE WA-1-3 = LAYERS \$ LAYERS FOR THE EXTERIOR WALL CONSTRUCTION INSIDE-FILM-RES = 0.6800\$ HR-SOFT-F /BTU (REFERENCE FROM IECC1107) MATERIAL = (POLY-EXP-2, CONCRETE-LI-WEIGHT).. \$ MATERIALS FROM OUTSIDE TO INSIDE R00-1 = LAYERS \$ LAYERS FOR THE ROOF CONSTRUCTION INSIDE-FILM-RES = 0.76\$ HR-SOFT-F /BTU (REFERENCE FROM IECC1107) = (ROOF-GRAVEL-MAT, BUILTUP-MATERIAL ROOFING-MAT, POLY-EXP, SOFT-WOOD) ... \$ MATERIALS FROM OUTSIDE TO INSIDE DOOR-LAY1 = LAYERS \$ REFERENCED FROM IECC1107 FILE MATERIAL = (GYPSUM, MINERAL-WOOL1, SOFT-WOOD1, GYPSUM) \$ Ś U CONSTRUCTIONS ******* Ś \$ Ś

WALL-1 = CONSTRUCTION \$ EXTERIOR WALL CONSTRUCTION (LAYERED CONSTRUCTION)

LAYERS = WA-1-2\$ LAYERS OF THE EXTERIOR WALL CONSTRUCTION ABSORPTANCE = 0.7000\$ DOE-2.1E DEFAULT FROM REFERENCE PT1 III.47 ROUGHNESS = 3.0000\$ DOE-2.1E . . DEFAULT FROM REFERENCE PT1 III.47 $WAT_{I}-2$ = CONSTRUCTION \$ EXTERIOR WALL CONSTRUCTION (LAYERED CONSTRUCTION) LAYERS = WA - 1 - 3\$ LAYERS OF THE EXTERIOR WALL CONSTRUCTION ABSORPTANCE = 0.7000\$ DOE-2.1E DEFAULT FROM REFERENCE PT1 III.47 ROUGHNESS = 3.0000. . \$ DOE-2.1E DEFAULT FROM REFERENCE PT1 III.47 ROOF-1 = CONSTRUCTION \$ ROOF CONSTRUCTION (LAYERED CONSTRUCTION) LAYERS = ROO - 1\$ LAYERS OF THE ROOF CONSTRUCTION (LAYERED CONSTRUCTION) = 0.7000ABSORPTANCE \$ DOE-2.1E DEFAULT FROM REFERENCE PT1 III.47 = 3.0000 ... ROUGHNESS \$ DOE-2.1E DEFAULT FROM REFERENCE PT1 III.47 DOOR-1 = CONSTRUCTION \$ REFERENCED FROM IECC1107 FILE) LAYERS = DOOR-LAY1 = 0.2 .. \$ IECC 2001 (RESIDENTIAL BUILDING) (BTU/HR.FT^2.F)

Texas A&M University

WINDOWS/DOORS

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* * * * * * * * * * * *					TYPE CODE				
\$					PANES	=	1.0000	:	\$ FROM
* * * * * * * * * * * * * * * *	******	*****	* * * *	* * * * * *	THE WINDOWS-5 LI	BRARY			
* * * * * * * * * * * * * * * *	*****	* * * * * * * * * * * * * * * * *	* * * *	* * * * * *	GLASS-CONDUCTANC	C =	1.4700	:	\$ FROM
* * * * * * * * * * * * * * * *	*****	* * * * * * * * * * *			THE WINDOWS-5 LI	BRARY			
					VIS-TRANS	=	0.9000	:	\$ FROM
\$ THE SIMULATION	I TOOL (D	OE-2.1E) CAN AG	CCEP	Г	THE WINDOWS-5 LI	BRARY			
CUSTOM WINDOWS E	DESIGNED	USING WINDOWS-S	5 (LI	BNL)	INSIDE-EMISS	=	0.8400	:	\$ FROM
PROGRAM AS A					THE WINDOWS-5 LI	BRARY			
\$ REASON WINDOWS	S AND DOO	RS ARE MODELED	USI	NG	OUTSIDE-EMISS	=	0.8400	:	\$ FROM
WINDOWS-5 (LBNL)	PROGRAM	FOR CONSISTANC	CY.		THE WINDOWS-5 LI	BRARY			
					SPACER-TYPE-CODE	2 =	1.0000	:	\$ FROM
W-1	=	GLASS-TYPE			THE WINDOWS-5 LI	BRARY (A	ALUMINIU	M)	
\$ CUSTOM WINDOW	FOR LOWE	R SOUTH FRONT V	WALL	AND	FRAME-ABS	=	0.7000	:	\$ FROM
BACK WINDOWS (WI	NDOWS-5)				THE WINDOWS-5 LI	BRARY			
GLASS-TYPE-CODE	=	2001	\$	GLASS	CONVERGENCE-TOL	=	0.0000		\$ FROM
TYPE CODE					THE WINDOWS-5 LI	BRARY			
PANES	=	1.0000	\$	FROM					
THE WINDOWS-5 LI	BRARY				\$				
GLASS-CONDUCTANC	2 =	1.4700	\$	FROM	* * * * * * * * * * * * * * * * *	* * * * * * * * *	******	* * * * * * * * * * *	******
THE WINDOWS-5 LI	BRARY				* * * * * * * * * * * * * * * * *	* * * * * * * * *	******	* * * * * * * * * * *	* * * * * * *
VIS-TRANS	=	0.9000	\$	FROM	* * * * * * * * * * * * * * * * *	* * * * * * * * *	******	* * * *	
THE WINDOWS-5 LI	BRARY				\$				
INSIDE-EMISS	=	0.8400	\$	FROM	* * * * * * * * * * * * * * * *	*******	*******	* * * * * * * * * * *	* * * * * * *
THE WINDOWS-5 LI	BRARY				**** OCCUPANC	CY SCHEDU	JLE		
OUTSIDE-EMISS	=	0.8400	\$	FROM	* * * * * * * * * * * * * * * * *	* * * * * * * * *	******	* * * * * * * * * * *	* * * * * * *
THE WINDOWS-5 LI	BRARY				* * * * *				
SPACER-TYPE-CODE	2 =	1.0000	\$	FROM	\$				
THE WINDOWS-5 LI	BRARY (A	LUMINIUM)			* * * * * * * * * * * * * * * * *	*******	*******	* * * * * * * * * * *	* * * * * * *
FRAME-ABS	=	0.7000	\$	FROM	* * * * * * * * * * * * * * * * *	*******	*******	* * * * * * * * * * *	* * * * * * *
THE WINDOWS-5 LI	BRARY				* * * * * * * * * * * * * * * * *	*******	******	* * * *	
CONVERGENCE-TOL	=	0.0000	\$	FROM					
THE WINDOWS-5 LI	BRARY				OC-1	= DAY-SC	CHEDULE	(1,8) (0.0	0)
								(9,11) (1	.0)
W-2	=	GLASS-TYPE						(12,14)	
\$ CUSTOM WINDOW	FOR UPPE	R SOUTH FRONT V	WALL		(0.8, 0.4, 0.8)				
WINDOWS (WINDOWS	5-5)							(15,18) (1	1.0)

(0.5,0.1,0.1)	(19,21)	LIGHTS-1 LT-WEEK	=SCHEDULE	THRU DEC 31
((,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	(22,24) (0.0)			
••		\$		
DC-2 = DAY-SCHEDULE ((1,24) (0.0)	* * * * * * * * * * * *	* * * * * * * * * * * * * * * * * * * *	*****
		* * * * * * * * * * * *	* * * * * * * * * * * * * * * * * * * *	* * * * * * * * * * * * * * * * * * *
OC-WEEK = WEEK-SCHEDULE ((WD) OC-1 (WEH)	* * * * * * * * * * * *	* * * * * * * * * * * * * * * * * * * *	* * * *
DC-2		\$		
OCCUPY-1 = SCHEDULE T	HRU DEC 31 OC-	* * * * * * * * * * * *	* * * * * * * * * * * * * * * * * * * *	* * * * * * * * * * * * * * * * * *
WEEK		**** EQUI	PMENT SCHEDULE	
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\$	· + + + + + + + + + + + + + + + + + + +	* * * * * * * * * * * * *	*****************	* * * *
				(1 0) (0 02)
^^^^^ LIGHTING SCHEDULE	^ LIGHTING SCHEDULE ************************************		=DAY-SCHEDULE	(1,8) (0.02) (9,14)
* * * * *		(0.4,0.9,0.9	,0.9,0.9,0.9)	
\$				(15,20)
* * * * * * * * * * * * * * * * * * * *	* * * * * * * * * * * * * * * *	(0.8,0.7,0.5		
* * * * * * * * * * * * * * * * * * * *	* * * * * * * * * * * * * * * *			(21,24) (0.02)
* * * * * * * * * * * * * * * * * * * *	* * *	••		
		EQ-2	=DAY-SCHEDULE	(1,24) (0.2)
LT-1 =DAY-SCHEDULE	(1,8) (0.05)	••		
SOFFICES IICHTING SCHEDUITE HAS BE	(9,18) (1.0) YEN SET TO ONE	EQ-WEEK	=WEEK-SCHEDULE	(MON,FRI) EQ-1
DURING OFFICE HOURS		EOUTP-1		THRI DEC 31
bolding office moons.	(19, 24)	EO-MEER Hõoii i	Seneboll	THIC DEC 91
(0, 05)	(1),24)	BQ WEBK		
(0.03)		¢		
	(1 24) (0 05)	੨ *******	* * * * * * * * * * * * * * * * * * * *	****
	(1,24) (0.03)	* * * * * * * * * * * *	* * * * * * * * * * * * * * * * * * * *	* * * * * * * * * * * * * * * * * *
••		********	****	****
	(MON FRI) LT-	Ś		
1 (WEH) LT-2	(MON,FRI) LT-	\$ * * * * * * * * * * * * *	*****	* * * * * * * * * * * * * * * * * * *

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**** GENERAL SPACE DEFINITIONS	SPACE1-1
************	ZONE-TYPE
\$	DEFAULTS
****************	AREA

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OFFICE

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*	*	*	*	*				S	Ρ	E	С	Ι	F	Ι	С		S	Ρ	A	С	Е		D	Е	Т	A	Ι	L	S																		
*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	* :	* :	*
*	*																																														

= SPACE-CONDITIONS

\$	
* * * * * * * * * * * * * * * * * * * *	******
* * * * * * * * * * * * * * * * * * * *	******
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\$				
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* * * * * * * * * * * * * * * * * * *	****	**********	**;	* * * * * * * * * * * *
* * * * * * * * * * * * * * * * * * *	* * * * *	******	ł	
\$				
* * * * * * * * * * * * * * * * * * *	****	**********	**;	* * * * * * * * * * * *
**** SPAC	E1-1			
* * * * * * * * * * * * * * * * * * *	****	***********	**;	* * * * * * * * * * * *
* *				
\$				
* * * * * * * * * * * * * * * * * * *	* * * * *	**********	**;	* * * * * * * * * * * *
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* * * * * * * * * * * * * * * * * * *	****	**********	٢	
SPACE1-1	=	SPACE		
ZONE-TYPE	=	CONDITIONED	\$	DOE2
DEFAULTS				
AREA	=	5000		
VOLUME	=	70000		
Х	=	0.0000		
Y	=	0.0000	\$	DOE2
DEFAULTS				
Z	=	10.0000	\$	DOE2
DEFAULTS				
AZIMUTH	=	0.0000	\$	DOE2
DEFAULTS				
MULTIPLIER	=	1.0000	\$	DOE2
DEFAULTS				
FLOOR-WEIGHT	=	70	\$	IECC
2001,402.1.3.3,DOE	2 DEF	FAULTS IS 70		
NUMBER-OF-PEOPLE	=	50		
PEOPLE-SCHEDULE	=	OCCUPY-1		
PEOPLE-HEAT-GAIN	=	400	\$	DOE2
DEFAULTS				
PEOPLE-HG-LAT	=	130.3	\$	DOE2
DEFAULTS				
PEOPLE-HG-SENS	=	252.2	\$	DOE2
DEFAULTS				
EQUIP-SCHEDULE	=	EQUIP-1		

EQUIPMENT-W/SQFT DEFAULTS	= 1	\$ DOE2	LIGHT-CTRL-TYPE1 LIGHTING CONTROL FOR	= CONTINUOUS \$ TYPE OF PORTRION OF ZONE AREA
AIR-CHANGES/HR	= 0.25	\$ DOE2	CONTROLLED BY SENSOR	1
DEFAULTS			LIGHT-CTRL-TYPE2	= CONTINUOUS \$ TYPE OF
TEMPERATURE	= (73)	\$ DOE2	LIGHTING CONTROL FOR	PORTRION OF ZONE AREA
DEFAULTS			CONTROLLED BY SENSOR	2
SOURCE-TYPE	= ELECTRIC	\$ DOE2	MIN-POWER-FRAC	= 0 \$ LOWEST
DEFAULTS			INPUT POWER FRACTION	FOR CONTINUOUSLY DIMMABLE
SOURCE-POWER	= 0.0000	\$ DOE2	LIGHING CONTROL SYST	EM
DEFAULTS			MIN-LIGHT-FRAC	= 0 \$ SPECIFIES
EQUIP-LATENT	= 0.0000	\$ DOE2	THE FRACTIONAL LIGHT	OUTPUT THAT A CONTINUOUSLY
DEFAULTS			DIMNMABLE	
EQUIP-SENSIBLE	= 1.0000	\$ DOE2		\$ LIGHTING
DEFAULTS			CONTROL SYSTEM PRODU	CES AT THE MINIMUM
SOURCE-LATENT	= 0.5	\$ DOE2	FRACTIONAL INPUT POW	ER GIVEN BY MIN-POWER-FRAC
DEFAULTS				
SOURCE-SENSIBLE	= 0.4	\$ DOE2	FRONT-1	= EXTERIOR-WALL
DEFAULTS			HEIGHT	= 8
FLOOR-MULTIPLIER	= 1.0000	\$ DOE2	WIDTH	= 100
DEFAULTS			Х	= 0
LIGHTING-SCHEDULE	= LIGHTS-1		Y	= 0
LIGHTING-TYPE	= REC-FLUOR-R	V	Z	= 0
LIGHT-TO-SPACE	= 0.80		AZIMUTH	= 180
LIGHTING-W/SQFT	= 1.5		CONSTRUCTION	= WALL-1
DAYLIGHTING	= YES	\$ DAYLIGHING	TILT	= 90.0000 \$ DOE2
OPTION IS SWITCHED ON	N		DEFAULTS	
LIGHT-REF-POINT1 :	= (25,25,2.7)	\$ LOCATION OF		
THE FIRST DAYLIGHT SH	ENSOR		WF-1	= WINDOW
LIGHT-REF-POINT2 :	= (75,25,2.7)	\$ LOCTION OF	WIDTH	= 45
THE SECOND DAYLIGHT S	SENSOR		HEIGHT	= 4.0000
ZONE-FRACTION1	= 0.5	\$ FRACTION OF	Х	= 52.5
THE ZONE CONTROLLED H	BY SENSOR 1		Y	= 3.0000
ZONE-FRACTION2	= 0.5	\$ FRACTION OF	GLASS-TYPE	= W-1
THE ZONE CONTROLLED H	BY SENSOR 2			
LIGHT-SET-POINT1	= 50	\$ TARGET	FRONT-2	= EXTERIOR-WALL
ILLUMINATION (FC) REG	QUIRED AT SENS	OR 1	HEIGHT	= 8
LIGHT-SET-POINT2	= 50	\$ TARGET	WIDTH	= 100
ILLUMINATION (FC) REG	QUIRED AT SENS	OR 2	Х	= 0
			Y	= 25

Z	= 16		\$OVERHANG-W	= 0.0	DOE-2
AZIMUTH	= 180		DEFAULT, UNUSED (FT)		
CONSTRUCTION	= WALL-1		\$OVERHANG-D	= 0.0	DOE-2
TILT	= 90.0000 .	. \$ DOE2	DEFAULT, UNUSED (FT)		
DEFAULTS			\$OVERHANG-ANGLE	= 0.0	DOE-2
			DEFAULT, UNUSED (DEGRE	ES)	
WF-2	= WINDOW		\$LEFT-FIN-A	= 0.0	DOE-2
WIDTH	= 90		DEFAULT, UNUSED(FT)		
HEIGHT	= 3.0000		\$LEFT-FIN-B	= 0.0	DOE-2
Х	= 5		DEFAULT, UNUSED(FT)		
Y	= 4.0000		\$LEFT-FIN-H	= 0.0	DOE-2
GLASS-TYPE	= W-2		DEFAULT, UNUSED(FT)		
			\$LEFT-FIN-D	= 0.0	DOE-2
PR1	= POLYGON \$ F	ROM	DEFAULT, UNUSED (FT)		
DOCUMENTATION UPDATE	PACKAGE #2 PA	GE 2.129	\$RIGHT-FIN-A	= 0.0	DOE-2
			DEFAULT, UNUSED(FT)		
			\$RIGHT-FIN-B	= 0.0	DOE-2
(100,0,0) $(100,50,0)$ (100,50,8) (100,	25,24)	DEFAULT, UNUSED (FT)		
(100,25,16) (100,0,8)			\$RIGHT-FIN-H	= 0.0	DOE-2
RIGHT-1 = EXTERIOR-W	ALL POLYGON	= PR1	DEFAULT, UNUSED (FT)		
X	= 100		ŚRIGHT-FIN-D	= 0.0	DOE-2
Y	= 0		DEFAULT, UNUSED (FT)		
7.	= 0		SINF-COEF	= 0.0	USED IF
CONSTRUCTION	= WAT.T1		INFILTRATION METHOD=	CRACK(0 TO 160)
001101110011011	•••		SKY-FORM-FACTOR	= 0 5	, Sarrttrary
DR-1	= DOOR S(REFE	RENCED FROM	VALUE(0, TO, 1)	0.0	YIIIDI IIUIIII
TECC1107 ETLE)			CND-FORM-FACTOR	= 0 5	\$ A R R T T R A R V
WIDTH	- 3		VALUE(0, TO, 1)	- 0.5	YANDI INANI
	- 7		SCHADING_DIVISIONS	- 10	
V	- 25		TNCIDE_VIC_DEEL	- 0 0	SDOF-2
A V	- 25		INSIDE-VIS-REFL	-0.0	ŞDOE-Z 1)
I = 0.0	- 0	Ć (EE)	DEFAULT, FOR DAILIGHT.	ING CALC (U IU	」)
SETBACK = 0.0	- 0000 1	-> (ΕT)			DENCED EDOM
CONSTRUCTION	= DOOR-1			= DOOR \$ (REFE	RENCED FROM
ŞMULTIPLIER	=	UNUSED	IECCIIO/ FILE)	2	
SOVERHANG-A	= 0.0	DOE-2	WID'I'H	= 3	
DEFAULT, UNUSED (FT)	0.0		HE1GHT	= /	
SOVERHANG-B	= 0.0	DOE-2	X	= 22	
DEFAULT, UNUSED (FT)			Y	= 0	
			SETBACK = 0.0		\$(FT)
CONSTRUCTION	= DOOR - 1		НЕТСИТ	= 8	
-----------------------	-------------------------	---------------	------------------------------------	---------------------------	
SMIILTIPI TER	=	IINIISED		= 100	
SOVERHANC-A	= 0 0	DOF = 2	X	= 100	
DEFAILT INNISED (FT)	- 0.0		X V	= 50	
SOVERHANC-R	- 0 0		1 7	- 0	
DEFAILT INNEED (FT)	- 0.0	DOE 2		- 0	
SOVEDUANC M	- 0 0	DOF 2			
SOVERNANG-W	- 0.0	DOE-2	CONSTRUCTION	- WALL-I	
DEFAULT, UNUSED (FT)	0 0		.T. T. T. T.	= 90.0000 \$DEGREES	
SOVERHANG-D	= 0.0	DOE-2			
DEFAULT, UNUSED (FT)	0 0		WB-1	= WINDOW	
SOVERHANG-ANGLE	= 0.0	DOE-2	W L D'L'H	= 24	
DEFAULT, UNUSED (DEGR	EES)		HEIGHT	= 4.0000	
ŞLEFT-FIN-A	= 0.0	DOE-2	X	= 11	
DEFAULT,UNUSED(FT)			Y	= 3.0000	
\$LEFT-FIN-B	= 0.0	DOE-2	GLASS-TYPE	= W - 1	
DEFAULT, UNUSED(FT)					
\$LEFT-FIN-H	= 0.0	DOE-2	WB-2	= WINDOW	
DEFAULT, UNUSED(FT)			WIDTH	= 24	
\$LEFT-FIN-D	= 0.0	DOE-2	HEIGHT	= 4.0000	
DEFAULT, UNUSED(FT)			Х	= 65	
\$RIGHT-FIN-A	= 0.0	DOE-2	Y	= 3.0000	
DEFAULT, UNUSED(FT)			GLASS-TYPE	= W-1	
\$RIGHT-FIN-B	= 0.0	DOE-2			
DEFAULT, UNUSED (FT)			PL1	= POLYGON \$ FROM	
\$RIGHT-FIN-H	= 0.0	DOE-2	DOCUMENTATION UPDATE	E PACKAGE #2 PAGE 2.129	
DEFAULT.UNUSED(FT)					
SRIGHT-FIN-D	= 0.0	DOE-2			
DEFAILT UNUSED (FT)	0.0	202 2	(0, 50, 0) $(0, 0, 0)$ $(0, 0, 0)$	8) (0,25,16)	
SINF-COEF	= 0 0	USED IF	(0, 25, 24) $(0, 50, 8)$	(0) (0) 20 / 20 /	
INFILTRATION METHOD	=CRACK(0 TO 160		LEFT-1	= EXTERIOR-WALL POLYGON =	
SKY-FORM-FACTOR	= 0.5	SARRITRARY	PT.1		
VALUE(0, TO, 1)	0.0		X	= 0	
CND-FORM-FACTOR	= 0 5	ŜARRITRARV	V	= 50	
VALUE(0, TO, 1)	- 0.5	ŞANDI INANI	1 7	- 0	
CULDING DIVICIONS	- 10				
YOUNDE MIC DEEL	- 10	SDOE-2	CONSTRUCTION	- WATT-T	
TNOTOE-ATO-KEET	$ \cup$ \cup \cdots	マロUビーZ 1 \	2 תח	- DOOD & DEFERENCED FROM	
DEFAULT, FOR DAILIGH	IING CALC (U TO	1) 1		- DOOK S (KELEKENCED EKOM	
			IECCIIU/ FILE)	2	
BACK-1	= EXTERIOR-WA		W L D'I'H	= 3	

HEIGHT	=	7		INSIDE-VIS-REFL	=	0.0	\$DOE-2
Х	=	25		DEFAULT, FOR DAYLIGHTI	ING	G CALC (O TO) 1)
Y	=	0					
SETBACK = 0.0			\$(FT)	DR-4	=	DOOR \$ (REE	FERENCED FROM
CONSTRUCTION	=	DOOR-1		IECC1107 FILE)			
\$MULTIPLIER	=		UNUSED	WIDTH	=	3	
\$OVERHANG-A	=	0.0	DOE-2	HEIGHT	=	7	
DEFAULT, UNUSED (FT)				Х	=	22	
\$OVERHANG-B	=	0.0	DOE-2	Y	=	0	
DEFAULT, UNUSED (FT)				SETBACK = 0.0			\$(FT)
\$OVERHANG-W	=	0.0	DOE-2	CONSTRUCTION	=	DOOR-1	
DEFAULT, UNUSED (FT)				\$MULTIPLIER	=		UNUSED
\$OVERHANG-D	=	0.0	DOE-2	\$OVERHANG-A	=	0.0	DOE-2
DEFAULT, UNUSED (FT)				DEFAULT, UNUSED (FT)			
\$OVERHANG-ANGLE	=	0.0	DOE-2	\$OVERHANG-B	=	0.0	DOE-2
DEFAULT, UNUSED (DEGRE	ES)	1		DEFAULT, UNUSED (FT)			
\$LEFT-FIN-A	=	0.0	DOE-2	\$OVERHANG-W	=	0.0	DOE-2
DEFAULT, UNUSED (FT)				DEFAULT, UNUSED (FT)			
\$LEFT-FIN-B	=	0.0	DOE-2	\$OVERHANG-D	=	0.0	DOE-2
DEFAULT, UNUSED(FT)				DEFAULT, UNUSED (FT)			
\$LEFT-FIN-H	=	0.0	DOE-2	\$OVERHANG-ANGLE	=	0.0	DOE-2
DEFAULT, UNUSED (FT)				DEFAULT, UNUSED (DEGREE	lS)		
\$LEFT-FIN-D	=	0.0	DOE-2	\$LEFT-FIN-A	=	0.0	DOE-2
DEFAULT, UNUSED (FT)				DEFAULT, UNUSED (FT)			
\$RIGHT-FIN-A	=	0.0	DOE-2	\$LEFT-FIN-B	=	0.0	DOE-2
DEFAULT, UNUSED (FT)				DEFAULT, UNUSED (FT)			
\$RIGHT-FIN-B	=	0.0	DOE-2	\$LEFT-FIN-H	=	0.0	DOE-2
DEFAULT, UNUSED (FT)				DEFAULT, UNUSED (FT)			
\$RIGHT-FIN-H	=	0.0	DOE-2	\$LEFT-FIN-D	=	0.0	DOE-2
DEFAULT, UNUSED (FT)				DEFAULT, UNUSED (FT)			
\$RIGHT-FIN-D	=	0.0	DOE-2	\$RIGHT-FIN-A	=	0.0	DOE-2
DEFAULT, UNUSED (FT)				DEFAULT, UNUSED (FT)			
\$INF-COEF	=	0.0	USED IF	\$RIGHT-FIN-B	=	0.0	DOE-2
INFILTRATION METHOD=	CRA	ACK(0 TO 160)		DEFAULT, UNUSED (FT)			
SKY-FORM-FACTOR	=	0.5	\$ARBITRARY	\$RIGHT-FIN-H	=	0.0	DOE-2
VALUE(0 TO 1)				DEFAULT, UNUSED(FT)			
GND-FORM-FACTOR	=	0.5	\$ARBITRARY	\$RIGHT-FIN-D	=	0.0	DOE-2
VALUE(0 TO 1)				DEFAULT, UNUSED(FT)			
\$SHADING-DIVISIONS	=	10					

August 2012

INFILTRATION METHOD=CRACK(0 TO 160) SKY-FORM-FACTOR = 0.5 \$ARBITRARY VALUE(0 TO 1) GND-FORM-FACTOR = 0.5\$ARBITRARY VALUE(0 TO 1) \$SHADING-DIVISIONS = 10 = 0.0 INSIDE-VIS-REFL •• DEFAULT, FOR DAYLIGHTING CALC(0 TO 1) FLOOR-1 = EXTERIOR-WALL HEIGHT = 50WIDTH = 100Х = 0 Y = 50 7 = 0 AZIMUTH = 180CONSTRUCTION = WALL-2 TILT = 180.0000 ... REFERENCE FROM BUILDING ENERGY SIMULATION VOL. 23, No.6, PAGE 21 WINKELMANN MEMO TOP-1 = EXTERIOR-WALL HEIGHT = 30.39WIDTH = 104Х = -2 Y = -3.95Ζ = 6.73 = 180AZIMUTH CONSTRUCTION = ROOF-1= 17.7400 ... TILT DEFAULTS TOP-2 = EXTERIOR-WALL = 36.35 HEIGHT WIDTH = 104Х = 102Y = 52.257 = 6.55

= 0.0

USED IF

\$DOE-2

\$

\$ DOE2

\$INF-COEF

AZIMUTH = 0 CONSTRUCTION = ROOF - 1= 32.6200 .. \$ DOE2 TILT DEFAULTS \$---HOURLY REPORTS---\$ PLTSCH = SCHEDULE THRU JAN 14 (ALL) (1,24) (1)THRU AUG 9 (ALL) (1, 24) (1) THRU DEC 31 (ALL) (1,24) (1) .. PLOTER1 = REPORT-BLOCK VARIABLE-TYPE = GLOBAL VARIABLE-LIST = (1, 4, 6) ... \$ CLEARNESS NUMBER, DRY BULB TEMPERATURE (°F), CLOUD AMOUNT (0 TO 10) FROM REFERENCE PT1 III.101 PLOTER2 = REPORT-BLOCKVARIABLE-TYPE = BUILDING VARIABLE-LIST = (1, 2, 19, 20, 37).. \$ BUILDING HEATING LOAD (SENSIBLE), BUILDING HEATING LOAD (LATENT), BUILDING COOLING LOAD (SENSIBLE), BUILDING COOLING LOAD (LATENT), BUILDING ELECTRIC TOTAL FROM REFERENCE PT1 III.103 AND III.104 LDS-REP-1 = HOURLY-REPORTREPORT-SCHEDULE = PLTSCHREPORT-BLOCK = (PLOTER1, PLOTER2) OPTION = PRINT .. END .. COMPUTE LOADS . . INPUT SYSTEMS INPUT-UNITS = ENGLISH \$DOE-2 DEFAULT (OR METRIC)

\$DOE-2 DEFAU	OUTPUT-UNITS ULT(OR METRIC)	= ENGLISH	R1 SUPPLY-LO=5	=DAY-RESET-SCH	SUPPLY-HI=60	
					OUTSIDE-LO=30	
SUMMARY)	SYSTEMS-REPORT	SUMMARY = (ALL-	OUTSIDE-HI= SAT-RESET	=75 =RESET-SCHEDULE	THRU DEC 31 (ALL	.)
		VERIFICATION	R1			
= (SV-A)		REPORT-FREQUENCY		\$ SYSTE	M DESCRIPTION	
= HOURLY					ON CEM/DED_0	
= NO-SAVE		HOURLI-DAIA-SAVE	ZAIR	=ZONE-AIR	UA-CEM/PER=0	
	S SYSTEMS SCHE	DILLES	CONTROL DESIGN-COOL	=ZONE-CONTROL	DESIGN-HEAT-T=70	
					HEAT-TEMP-SCH= HE	CAT-
FAN-1	=DAY-SCHEDULE	(1,24) (1)	SCHED		COOL-TEMP-SCH= CC	OL-
FAN-2	=DAY-SCHEDULE	(1,24) (1)	SCHED			
FAN-SCHED	=SCHEDULE	THRU DEC 31	TYPE=REVERS	SE-ACTION	THERMOSTAT-	
(WD) FAN-I	(WER) FAN-2			\$ FOL	LOWING AIR FLOWS A	RE
HEAT-1 HEAT-2	=DAY-SCHEDULE =DAY-SCHEDULE	(1,24) (68) (1,24) (68)	FROM RUN 3	SV-A REPORT, \$ DIV	IDED BY ALTITUDE	
HEAT-WEEK (WEH) HEAT-	=WEEK-SCHEDULE -2	(MON, FRI) HEAT-1	MULTIPLIER			
HEAT-SCHED	=SCHEDULE	THRU DEC 31 HEAT-	SPACE1-1 SIZING-OPTI	=ZONE	ZONE-AIR=ZAIR	
COOLOFF (1 24) (1)	=SCHEDULE	THRU DEC 31 (ALL)	CONTROL		ZONE-CONTROL	=
HEATOFF	=SCHEDULE	THRU DEC 31 (ALL)	CONTROL		ZONE-TYPE	=
(1, 24) (1)			CONDITIONED)	BASEBOARD-RATING	=
COOL-1	=DAY-SCHEDULE	(1,24) (78)	0.00	\$ BTU/HR		_
COOL-Z COOL-WEEK	=WEEK-SCHEDULE	(MON, FRI) COOL-1	0.00	\$ BTU/BTU	FANEL-LOSS-RAIIO	_
(WEH) COOL-	-2		0 9 F		EXHAUST-EFF	=
COOL-SCHED WEEK	=SCHEDULE	THRU DEC 31 COOL-	U./5 \$ FF	AC. OR MULT.	BASEBOARD-CTRL	=
			OUTDOOR-RES	SET		

1.00	\$ R		= 65	
0.0003	\$ KW/CFM	ZONE-FAN-KW/FLOW =	= (SPACE1-1)	ZONE-NAMES
SVAV		TERMINAL-TYPE =	= ELECTRIC	HEAT-SOURCE
		ZONE-REPORTS =		ZONE-HEAT-SOURCE
YES			= ELECTRIC	PREHEAT-SOURCE
S-CONT COOLOFF	=SYSTEM-CONTROL	COOLING-SCHEDULE=	= ELECTRIC	BASEBOARD-SOURCE
		HEATING-SCHEDULE=	= ELECTRIC	
HEATOFF		HEAT-SET-T=65	= ON	VARIABLE-1
		COOL-CONTROL=RESET COOL-RESET-	= 1.00 \$ DOE-2.1 DEFAULT	SIZING-RATIO
SCH=SAT-RES	ET	MTN-SUDDI V-T=60	= 1 00 \$ DOF-2 1 DEFAILT	HEAT-SIZING-RATIO
		MIN SOTTET 1 00		COOL-SIZING-RATIO
S-FAN SCHED FAN-	=SYSTEM-FANS CONTROL=SPEED	FAN-SCHEDULE=FAN-	= 1.00 \$ DOE-2.1 DEFAULT	RETURN-AIR-PATH
SUPPLY-EFF=	.55	SUPPLY-STATIC=2.0	= DIRECT	HUMIDIFIER-TYPE
	∩N_7NIV	NIGHT-CYCLE-	= ELECTRIC	SHM-HD-SUIDCE
CIND-CICDE	ON ANI		= ZONE	SIW IIF SOURCE
S-TERM	=SYSTEM-TERMINA	L REHEAT-DELTA-T=58 MIN-CFM-RATIO=0.1	= 100.00 \$ PERCENT	MAX-HUMIDITY
			= 0 00 \$ PERCENT	MIN-HUMIDITY
SYST-1	=SYSTEM	SYSTEM-TYPE=SUM		PREHEAT-T
= 7366		SUPPLY-CFM	= 45 \$ £'	DESC-CTRL-MODE
= S-CONT		SYSTEM-CONTROL	= 0.00	DESC-DEW-SET
- C-FAN		SYSTEM-FANS	= 50.00 \$ F	
- 5 PAN		SYSTEM-TERMINAL	= TEMP	CA CONTROL
= S-TERM				

THROTTLING-RANGE =

\$ ECONO-LIMIT-T

3 37 S R	SUPPLY-DELTA-T =	DHWSCH-1 = SCHEDULE THRU JAN 14 (ALL) $(1, 24)$
0 0011 \$ KW/CFM	SUPPLY-KW/FLOW =	THRU AUG 9 (ALL) $(1, 24)$ (1) THRU DEC 31 (ALL) $(1, 24)$
	MOTOR-PLACEMENT =	(1)
IN-AIRFLOW	FAN-PLACEMENT =	PLTSCH2 = SCHEDULE THRU JAN 14 (ALL) (1,24)
DRAW-THROUGH	MAX-FAN-RATIO =	(1) THRU AUG 9 (ALL) (1,24) (1)
1.10 \$ FRAC. OR MULT.	MIN-FAN-RATIO =	THRU DEC 31 (ALL) (1,24) (1)
0.300 \$ FRAC. OR MULT.	NIGHT-VENT-CTRL =	PLOTER3 = REPORT-BLOCK
NOT-AVAILABLE	NIGHT-VENT-DT =	VARIABLE-TYPE = GLOBAL VARIABLE-LIST = (8) \$ DRY BULB
5.0 \$ R	RATED-CCAP-FFLOW	TEMPERATURE (°F) FROM SUPLEMENT PAGE A.16
= SDL-C80	COOL-CAP-FT	PLOTER4 = REPORT-BLOCK VARIABLE-TYPE = PLANT1
= SDL-C7	COOL-SH-FT	VARIABLE-LIST = $(1, 2, 3)$ \$ TOTAL COOLING LOAD (Btu/br), TOTAL HEATING LOAD
= SDL-C27	COIL-BE	(Btu/hr), TOTAL ELECTRICAL LOAD (Kw) FROM
= 0.0370 \$ FRAC. OR MULT.	COIL DI	$IDC_DED_2 = UOUDIV_DEDODT$
= SDL-C37	COIL-BF-FFLOW	REPORT-SCHEDULE = PLTSCH2
= SDL-C47	COIT-RE-E.L	REPORT-BLOCK= (PLOTER3, PLOTER4)OPTION= PRINT
PLANT1 = PLANT-ASSIGNMENT (SYST-1) \$ REFERENCE FROM THE	SYSTEM-NAMES = IECC1107 FILE	END Compute systems
ELECTRIC	DHW-IYPE =	\$DOE-2 DEFAULT (OR METRIC)
DHWSCH-1	DHW-SCH = DHW-GAL/MIN =	OUTPUT-UNITS = ENGLISH \$DOE-2 DEFAULT(OR METRIC)
0.03472 \$CALCULATED FROM MANUAL PAGE 7-14	ASHRAE 90.1 USER'S	PLANT1 = PLANT-ASSIGNMENT

PLANT-REPORT SUMMARY=(PS-A, PS-E, BEPS)	\$TYPE OF BUILDING \$SAMPLE1E-RUN3A WITH MODIFIC \$TEST CASE ONE SIX ZONE MOD	CATION EL
\$ EQUIPMENT DESCRIPTION		
	\$FILE NAME = 01A1.INP	
\$ HOT-WATER BOILER		
SBOIL1 =PLANT-EQUIPMENT TYPE=HW-BOILER	\$*****	* * * * * * * * * * * * * * * * * * * *
SIZE=-999 \$ AUTOSIZE	* * * * * * * * * * * * * * * * * * * *	* * * * *
	\$ PROGRAM:	DOE-2 SIMULATION
PLANT-PARAMETERS HERM-REC-COND-	INPUT FILE	
TYPE=AIR	\$	
	\$ LANGUAGE:	DOE-2.1E BDL VERSION
\$ AIR-COOLED RECIPROCATING	110	
CHILLER	\$	
	\$ SPONSOR:	National Science
CHIL1 =PLANT-EQUIPMENT TYPE=HERM-REC-CHLR	Foundation	
SIZE=-999 \$ AUTOSIZE	\$	
	\$ COPYRIGHT:	NSF, 2010.
PLANT-COSTS PROJECT-LIFE=25 DISCOUNT-	\$,
RATE=5	\$	
ENERGY-RESOURCE RESOURCE=ELECTRICITY	S DEVELOPER:	(PI) MARK J CLAYTON
ENERGY-RESOURCE RESOURCE=NATURAL-GAS	Ś	Professor
ENERGY/UNTT=100000	Ś	Department of
UNIT-NAME=THERMS	Architecture	
	Ś	Texas A&M
END	University, College Station	- TX
COMPLITE PLANT	s	PHONE: (979)845-2300
STOP	Ś	11101112. (3737013 2300
	Ś	(CO-PI) JEFF HABERI
	T Ph D P F.	
	\$	Professor
	\$	Department of
	Architocturo	Deparement of
	¢	Energy Systems
	Y Laboratory	пиетду рузсеща
	ć	Toxas ASM
This is the input file for Denver that uses SYSTEM-	Muniversity College Station	TCAD AUT TV
TYPE=VAVS	¢	(0.70) 8/5 - 60.65
	Y	LIGINE. (979)040-0000

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\$	(Co-PI) WEI YAN	******	* * * * * * * * * * * * * * * * * * * *	
\$	Assistant Professor			
\$	Department of			
Architecture	-			
\$	Texas A&M			
University, College Statio	n, TX	\$		
\$	PHONE: (979)845-0584			
\$		\$!	
\$ STUDENTS :	JOSE LUIS BERMUDEZ	!		
ALCOCER		\$!	
\$	Ph.D. student	l		
\$	Department of	\$!	
Architecture	-	l		
\$	Texas A&M	\$!	
University, College Statio	n, TX	l		
\$		\$!	
\$	SANDEEP KOTA	l		
\$	Ph.D. student	\$!	
\$	Department of	l		
Architecture	±	\$!	
\$	Texas A&M	l		
University, College Statio	n, TX	\$!	
\$		l		
\$	JONG BUM KIM	\$!	SPACE1-1
\$	Ph.D. student	!		
\$	Department of	\$!	
Architecture	-	!		
\$	Texas A&M	\$!	
University, College Statio	n, TX	!		
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\$	WOONSEONG JEONG	!		
\$	Ph.D. student	\$!	
\$	Department of	!		
Architecture	_	\$!	
\$	Texas A&M	!		
University, College Statio	n, TX	\$!	
\$!		

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\$!		
!	\$*************************************	CSIGN
\$!	DAYS************************************	* * * *
!		
\$	\$ DENVER DESIGN DAYS. DRY-BULB	AND DEW POINT
	TEMPERATURES FROM 1993 ASHRAE HA	ANDBOOK (CHAPTER
	24)	
INPUT LOADS INPUT-UNITS = ENGLISH \$DOE-2		
DEFAULT(OR METRIC)	WINTER1=DESIGN-DAY	\$ ALL VALUES
OUTPUT-UNITS = ENGLISH \$DOE-2	ARBITRARY	
DEFAULT(OR METRIC)	DRYBULB-HI= 1	\$ (DEG F)
	DRYBULB-LO= 1	\$ (DEG F)
TITLE	HOUR-HI= 13	\$ (HOURS)
LINE-1 *NSF PROJECT *	HOUR-LO= 1	\$ (HOURS)
LINE-2 *TEST CASE-1 *	DEWPT-HI= 32	\$ (DEG F)
LINE-3 *ONE-ZONE MODEL*	DEWPT-LO= 32	\$ (DEG F)
	DHOUR-HI= 15	\$ (HOURS)
RUN-PERIOD FEB 3 2010 THRU FEB 3 2010	DHOUR-LO=3	\$ (HOURS)
AUG 25 2010 THRU AUG 25 2010	WIND-SPEED= 7	\$ (KNOTS)
JAN 1 2010 THRU DEC 31 2010	WIND-DIR= 8	\$
	0=NORTH, 1=NNE	
	CLOUD-AMOUNT= 0	\$
ABORT ERRORS	0=CLEAR,10=OVERCAST	
DIAGNOSTIC DEFAULTS \$ ADDED	CLOUD-TYPE= 1	\$
COMMAND TO PRINT ALL THE DEFAULTS	0=SUMMER,2=FALL/SPRING,1=WINTER	
	CLEARNESS= 0.6	\$ VARIES FROM
LOADS-REPORT	0.5 TO 1.2	
SUMMARY = (ALL-SUMMARY) \$ ADDED	GROUND-T= 77	\$ (DEG F)
COMMAND TO PRINT ALL THE LOADS SUMMARY REPORTS	FROM REFERENCE PART II PAGE VIIJ	.93
VERIFICATION = (ALL-VERIFICATION) \$ ADDED		
COMMAND TO PRINT ALL THE LOADS VERIFICATION	SUMMER1=DESIGN-DAY	\$ ALL VALUES
REPORTS	ARBITRARY	
REPORT-FREQUENCY = HOURLY \$ DEFAULTS	DRYBULB-HI= 91	\$(DEG F)
FOR LOADS-REPORT	DRYBULB-LO= 91	\$(DEG F)
HOURLY-DATA-SAVE = NO-SAVE \$ DEFAULTS	HOUR-HI= 13	\$(HOURS)
FOR LOADS-REPORT	HOUR-LO= 3	\$(HOURS)
	DEWPT-HI= 59	\$(DEG F)
	DEWPT-LO= 59	\$(DEG F)
	DHOUR-HI= 15	\$(HOURS)

DHOUR-LO= 5		\$(HOURS)	DAYLIGHT-SAVINGS	= YES	\$ OPTIONS FOR
WIND-SPEED=	= 5	\$(KNOTS)	DAYLIGHT SAVINGS DOE-2	.1E DEFA	JLTS=YES
WIND-DIR= 6	ò	\$	GROSS-AREA	= 5000	\$ GROSS FLOOR
0=NORTH, 1=NNE			AREA OF THE CONDITIONE	D SPACE O	F THE BUILDING
CLOUD-AMOUN	0 =TI	\$	HEAT-PEAK-PERIOD	= (1, 24)	\$ DOE-2.1E
0=CLEAR,10=OVERCAST			DEFAULT UNUSED		
, CLOUD-TYPE=	= 0	\$	COOL-PEAK-PERIOD	= (1, 24)	\$ DOE-2.1E
0=SUMMER,2=FALL/SPRIN	IG,1=WINTER		DEFAULT UNUSED		
CLEARNESS=	0.6	\$ VARIES FROM	ATM-MOISTURE	=	
0.5 TO 1.2			(0.7,0.7,0.7,0.7,0.7,0	.7,0.7,0.	7,0.7,0.7,0.7,0.7
GROUND-T= 8		Ś(DEG F) FROM)	.,,	,,,
REFERENCE PART IT PAG	E VIII 93		,		Ŝ UNUSED DOE-
			21 E DEFAILTS CALCULAT	ED HOURLY	FROM DEWPOINT
< ***************	****	* * * * * * * *	TEMD BV		Inor Diwroini
PUTTOINC LOCATION INE			ATM_TIDRIDITY -		
***************************************	****	* * * * * * * * * * * * * *	$(0 \ 12 \ 0 \ 12 \ 0 \ 12 \ 0 \ 12 \ 0 \ 12 \ 0 \ 12 \ 0 \ 12 \ 0 \ 12 \ 0 \ 12 \ 0 \ 12 \ 0 \ 12 \ 0 \ 12 \ 0 \ 12 \ 0 \ 12 \ 0 \ 12 \ 0 \ 12 \ 0 \ 12 \ 0 \ 12 \ 0 \ 12 \ 0 \ 12 \ 0 \ 12 \ 0 \ 12 \ 0 \ 12 \ 0 \ 12 \ 0 \ 12 \ 0 \ 12 \ 0 \ 12 \ 0 \ 12 \ 0 \ 12 \ 0 \ 12 \ 0 \ 12 \ 0 \ 12 \ 0 \ 12 \ 0 \ 12 \ 0 \ 12 \ 0 \ 12 \ 0 \ 12 \ 0 \ 12 \ 0 \ 12 \ 0 \ 12 \ 0 \ 12 \ 0 \ 12 \ 0 \ 12 \ 0 \ 12 \ 0 \ 12 \ 0 \ 12 \ 0 \ 12 \ 0 \ 12 \ 0 \ 12 \ 0 \ 12 \ 0 \ 12 \ 0 \ 12 \ 0 \ 12 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ $	120120	
* * * * * * * * * *			(0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12)		5.12,0.12,0.12,0.
			12,0.12,0.12)		S UNULSED DOE
			21 E DEENILMO LICED TE		S UNUSED DUE-
			21.E DEFAULTS USED IF	WEATHER F.	ILE DO NOT HAVE
S THE LOCATION INFORM	N CUNNCED ED	DE/ LONGITUDE	SOLAR DATA		
AND ALTITUDE HAVE BEE	IN CHANGED FR	OM SAMPLE RUNSA		0 0000	
TO RUN THE SIMULATION	I FOR THE		X-REF	= 0.0000	S UNUSED DOE-
S DENVER WEATHER FILE	•		ZI.E DEFAULTS CORDINAT	ES TO TRAI	NSLATE BUILDING
			LOCATION		<u></u>
BUILDING-LOCATION	Ş.	BUILDING		= 0.0000	\$ UNUSED DOE-
LOCATION INPUT COMMAN	ID		21.E DEFAULTS CORDINAT	'ES TO TRAI	NSLATE BUILDING
LATITUDE	= 39.83 \$	LATITUDE FOR	LOCATION		
CITY OF DENVER			SHIELDING-COEF	= 0.2400	\$ DOE-2
LONGITUDE	= 104.65	\$ LONGITUDE FOR	DEFAULT, THIS COEFFICIE	NT USED II	N SHERMAN
CITY OF DENVER			GRIMSRUD INFILTRATION	METHOD	
ALTITUDE	= 5413.00	\$ ALTITUDE FOR			
CITY OF DENVER			TERRAIN-PAR1	= 0.8500	\$ DOE-2 DEFAULT
HOLIDAY	= YES \$	DOE-2.1E	IS A CONSTANT. USED TO	MODIFY T	HE FREE STREAM
DEFAULT FOR HOLIDAYS	= YES (USA-N	ATIONAL	WIND SPEED TO ACCOUNT	FOR GROUN	D ROUGHNESS AND
HOLIDAYES)			HEIGHT ABOVE GROUND LE	EVEL AT TH	E BUILDING SITE
TIME-ZONE	= 7 \$	TIME ZONE FOR	TERRAIN-PAR2	= 0.2000	\$ DOE-21.E
THE CITY OF DENVER AZ	IMUTH	= 0	DEFAULTS IS A CONSTANT	USED TO I	MODIFY THE FREE
\$ BUILDING AZIMUTH /	SAMP1E RUN 3	A AZIMUTH =	STREAM WIND SPEED TO A	CCOUNT FO	R GROUND
30/ TESTCASE= 0					

ROUGHNESS AND HEIGHT ABOVE GROUND LEVEL AT THE BUILDING SITE.

WS-TERRAIN-PAR1 = 1.0000 \$ DOE-21.E DEFAULTS IS A CONSTANT CORRESPONDING TO TERRAIN-PART1, BUT FOR THE LOCATION OF THE WIND SPEED MEASUREMENT; I.E., THE WEATHER STATION. = 0.1500 \$ UNUSED DOE-WS-TERRAIN-PAR2 21.E DEFAULTS IS A CONSTANT CORRESPONDING TO TERRAIN-PART2, BUT FOR THE LOCATION OF THE WIND SPEED MEASUREMENT; I.E., THE WEATHER STATION. WS-HEIGHT-LIST = (33.0) \$ DOE-21.E DEFAULTS SOLAR-REFL-CALC = NO-CALC \$ DOE-21.E DEFAULTS = NO ... SURF-TEMP-CALC

AZIMUTH = 90 \$(DEGREES)

WIDTH = 5.0

TRANSMITTANCE = 0.0\$(0 TO 1), DOE-2 DEFAULT = 0.9 TILT = 90(DEGREES), DEFAULT = 90SHADE-SCHEDULE = B-SH-1 .. \$ SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING BD2 = BUILDING-SHADEX = 0 Y = 45 Z = 0\$COORDINATES HEIGHT = 10.0\$(FT) WIDTH = 5.0\$(FT) AZIMUTH = 90\$(DEGREES) TRANSMITTANCE = 0.0\$(0 TO 1), DOE-2 DEFAULT = 0.9 TILT = 90(DEGREES), DEFAULT = 90SHADE-SCHEDULE = B-SH-1 .. \$ SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING BD3 = BUILDING-SHADEX = 20 Y = 0 Z = 0\$COORDINATES HEIGHT = 10.0\$(FT) WIDTH = 5.0\$(FT) AZIMUTH = 90\$(DEGREES) \$(0 TRANSMITTANCE = 0.0TO 1), DOE-2 DEFAULT = 0.9 TILT = 90(DEGREES), DEFAULT = 90SHADE-SCHEDULE = B-SH-1 .. \$ SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING

BD4 = BUILDING-SHADE

\$(FT)

$X = 20 \ Y = 45 \ Z = 0$	
\$COORDINATES	
HEIGHT = 10.0	\$(FT)
WIDTH = 5.0	\$(FT)
AZIMUTH = 90	
\$(DEGREES)	
TRANSMITTANCE = 0.0	\$(0
TO 1), $DOE-2$ DEFAULT = 0.9	
TILT = 90	
(DEGREES), DEFAULT = 90	
SHADE-SCHEDULE = B-SH-1	\$
SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE	
COMMANDS ARE USED FOR DAYLIGHTING	
BD5 = BUILDING-SHADE	
$X = 40 \ Y = 0 \ Z = 0$	
\$COORDINATES	
HEIGHT = 10.0	\$(FT)
WIDTH = 5.0	\$(FT)
AZIMUTH = 90	
\$(DEGREES)	
TRANSMITTANCE = 0.0	\$(0
TO 1), $DOE-2$ DEFAULT = 0.9	
TILT = 90	
\$(DEGREES),DEFAULT = 90	
SHADE-SCHEDULE = B-SH-1	\$
SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE	
COMMANDS ARE USED FOR DAYLIGHTING	
BD6 = BUILDING-SHADE	
$X = 40 \ Y = 45 \ Z = 0$	
\$COORDINATES	
HEIGHT = 10.0	\$(FT)
WIDTH = 5.0	\$(FT)
AZIMUTH = 90	
\$(DEGREES)	
TRANSMITTANCE = 0.0	\$(0
TO 1), $DOE-2$ DEFAULT = 0.9	

TILT = 90(DEGREES), DEFAULT = 90SHADE-SCHEDULE = B-SH-1 .. \$ SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING BD7 = BUILDING-SHADEX = 60 Y = 0 Z = 0\$COORDINATES \$(FT) HEIGHT = 10.0WIDTH = 5.0\$(FT) AZIMUTH = 90\$(DEGREES) \$(0 TRANSMITTANCE = 0.0TO 1), DOE-2 DEFAULT = 0.9 TILT = 90(DEGREES), DEFAULT = 90SHADE-SCHEDULE = B-SH-1 .. \$ SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING BD8 = BUILDING-SHADE X = 60 Y = 45 Z = 0\$COORDINATES HEIGHT = 10.0\$(FT) WIDTH = 5.0\$(FT) AZIMUTH = 90\$(DEGREES) \$(0 TRANSMITTANCE = 0.0TO 1), DOE-2 DEFAULT = 0.9 TILT = 90(DEGREES), DEFAULT = 90SHADE-SCHEDULE = B-SH-1 ... \$ SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING BD9 = BUILDING-SHADE X = 80 Y = 0 Z = 0

\$COORDINATES

HEIGHT = 10.0	\$(FT)
WIDTH = 5.0	Ş(FT)
AZIMUTH = 90	
\$(DEGREES)	
TRANSMITTANCE = 0.0	\$(0
TO 1), $DOE-2$ DEFAULT = 0.9	
TILT = 90	
\$(DEGREES),DEFAULT = 90	
SHADE-SCHEDULE = B-SH-1	\$
SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE	
COMMANDS ARE USED FOR DAYLIGHTING	
BD10 = BUILDING-SHADE	
X = 80 Y = 45 7 = 0	
SCOORDINATES	
HETGHT = 10.0	\$(FT)
WIDTH = 5 0	S(FT)
$\Delta Z T M I T H = 90$	Ŷ(⊥⊥)
Ś (DEGREES)	
φ (DECKEED) $\pi \varphi \lambda N S M T T T \lambda N C E - 0 0$	\$ (0
TO 1) DOF-2 DEFAULT = 0.9	Υ (U
$\frac{10}{10} \frac{1}{10} \frac{10}{10} \frac{1}{10} \frac{10}{10} \frac{10}{$	
$\frac{1111}{2} = \frac{1}{20}$	
S(DEGREES), DEFAULI - 90	ċ
SHADE-SCHEDULE = $B-SH-1$.	Ş
SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE	
COMMANDS ARE USED FOR DAYLIGHTING	
BD11 = BUILDING-SHADE	
BD11 = BUILDING-SHADE $X = 100 Y = 0 Z = 0$	
BD11 = BUILDING-SHADE X = 100 Y = 0 Z = 0 \$COORDINATES	
BD11 = BUILDING-SHADE X = 100 Y = 0 Z = 0 \$COORDINATES HEIGHT = 10.0	\$(FT)
BD11 = BUILDING-SHADE X = 100 Y = 0 Z = 0 \$COORDINATES HEIGHT = 10.0 WIDTH = 5.0	\$(FT) \$(FT)
BD11 = BUILDING-SHADE X = 100 Y = 0 Z = 0 \$COORDINATES HEIGHT = 10.0 WIDTH = 5.0 AZIMUTH = 90	\$(FT) \$(FT)
BD11 = BUILDING-SHADE $X = 100 \ Y = 0 \ Z = 0$ \$COORDINATES HEIGHT = 10.0 WIDTH = 5.0 AZIMUTH = 90 \$(DEGREES)	\$(FT) \$(FT)
BD11 = BUILDING-SHADE $X = 100 \ Y = 0 \ Z = 0$ \$COORDINATES HEIGHT = 10.0 WIDTH = 5.0 AZIMUTH = 90 \$(DEGREES) TRANSMITTANCE = 0.0	\$(FT) \$(FT) \$(0
BD11 = BUILDING-SHADE X = 100 Y = 0 Z = 0 \$COORDINATES HEIGHT = 10.0 WIDTH = 5.0 AZIMUTH = 90 \$(DEGREES) TRANSMITTANCE = 0.0 TO 1), DOE-2 DEFAULT = 0.9	\$(FT) \$(FT) \$(0
BD11 = BUILDING-SHADE $X = 100 \ Y = 0 \ Z = 0$ \$COORDINATES HEIGHT = 10.0 WIDTH = 5.0 AZIMUTH = 90 \$(DEGREES) TRANSMITTANCE = 0.0 TO 1), DOE-2 DEFAULT = 0.9 TILT = 90	\$(FT) \$(FT) \$(0

SHADE-SCHEDULE = B-SH-1 .. \$ SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING BD12 = BUILDING-SHADE X = 100 Y = 45 Z = 0\$COORDINATES \$(FT) HEIGHT = 10.0WIDTH = 5.0\$(FT) AZIMUTH = 90\$(DEGREES) \$(0 TRANSMITTANCE = 0.0TO 1), DOE-2 DEFAULT = 0.9 TILT = 90(DEGREES), DEFAULT = 90SHADE-SCHEDULE = B-SH-1 ... \$ SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING BD13 = BUILDING-SHADE X = 0 Y = 0 Z = 18.5\$COORDINATES \$(FT) HEIGHT = 24WIDTH = 4\$(FT) AZIMUTH = 180\$(DEGREES) TRANSMITTANCE = 0.0\$(0 TO 1), DOE-2 DEFAULT = 0.9 TILT = 17.74(DEGREES), DEFAULT = 90SHADE-SCHEDULE = B-SH-1 .. \$ SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING BD14 = BUILDING-SHADE X = 8 Y = 0 Z = 18.5\$COORDINATES \$(FT) HEIGHT = 24WIDTH = 4\$(FT)

AZIMUTH = 180\$(DEGREES) \$(0 TRANSMITTANCE = 0.0TO 1), DOE-2 DEFAULT = 0.9 TILT = 17.74(DEGREES), DEFAULT = 90SHADE-SCHEDULE = B-SH-1 .. Ś SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING BD15 = BUILDING-SHADE X = 12 Y = 0 Z = 18.5\$COORDINATES HEIGHT = 24\$(FT) \$(FT) WIDTH = 4AZIMUTH = 180\$(DEGREES) TRANSMITTANCE = 0.0\$(0 TO 1), DOE-2 DEFAULT = 0.9 TILT = 17.74(DEGREES), DEFAULT = 90SHADE-SCHEDULE = B-SH-1 .. \$ SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING BD16 = BUILDING-SHADEX = 16 Y = 0 Z = 18.5\$COORDINATES HEIGHT = 24\$(FT) WIDTH = 4\$(FT) AZIMUTH = 180\$(DEGREES) TRANSMITTANCE = 0.0\$(0 TO 1), DOE-2 DEFAULT = 0.9 TILT = 17.74(DEGREES), DEFAULT = 90

SHADE-SCHEDULE = B-SH-1 .. \$ SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING BD17 = BUILDING-SHADE X = 20 Y = 0 Z = 18.5\$COORDINATES HEIGHT = 24\$(FT) WIDTH = 4\$(FT) AZIMUTH = 180\$(DEGREES) TRANSMITTANCE = 0.0\$(0 TO 1), DOE-2 DEFAULT = 0.9 TILT = 17.74(DEGREES), DEFAULT = 90SHADE-SCHEDULE = B-SH-1 .. \$ SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING BD18 = BUILDING-SHADE X = 24 Y = 0 Z = 18.5\$COORDINATES HEIGHT = 24\$(FT) WIDTH = 4\$(FT) AZIMUTH = 180\$(DEGREES) \$(0 TRANSMITTANCE = 0.0TO 1), DOE-2 DEFAULT = 0.9 TILT = 17.74(DEGREES), DEFAULT = 90SHADE-SCHEDULE = B-SH-1 .. \$ SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING BD19 = BUILDING-SHADE X = 28 Y = 0 Z = 18.5

\$COORDINATES

HEIGHT = 24\$(FT) WIDTH = 4\$(FT) AZIMUTH = 180\$(DEGREES) TRANSMITTANCE = 0.0\$(0 TO 1), DOE-2 DEFAULT = 0.9 TILT = 17.74(DEGREES), DEFAULT = 90SHADE-SCHEDULE = B-SH-1 .. Ŝ SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING BD20 = BUILDING-SHADE X = 32 Y = 0 Z = 18.5\$COORDINATES HEIGHT = 24\$(FT) WIDTH = 4\$(FT) AZIMUTH = 180\$(DEGREES) \$(0 TRANSMITTANCE = 0.0TO 1), DOE-2 DEFAULT = 0.9 TILT = 17.74(DEGREES), DEFAULT = 90SHADE-SCHEDULE = B-SH-1 ... \$ SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING BD21 = BUILDING-SHADE X = 36 Y = 0 Z = 18.5\$COORDINATES HEIGHT = 24\$(FT) WIDTH = 4\$(FT) AZIMUTH = 180\$(DEGREES) \$(0 TRANSMITTANCE = 0.0TO 1), DOE-2 DEFAULT = 0.9

TILT = 17.74(DEGREES), DEFAULT = 90SHADE-SCHEDULE = B-SH-1 .. \$ SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING BD22 = BUILDING-SHADE X = 40 Y = 0 Z = 18.5\$COORDINATES HEIGHT = 24\$(FT) WIDTH = 4\$(FT) AZIMUTH = 180\$ (DEGREES) TRANSMITTANCE = 0.0\$(0 TO 1), DOE-2 DEFAULT = 0.9 TILT = 17.74(DEGREES), DEFAULT = 90SHADE-SCHEDULE = B-SH-1 .. \$ SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING BD23 = BUILDING-SHADE X = 44 Y = 0 Z = 18.5\$COORDINATES HEIGHT = 24\$(FT) WIDTH = 4\$(FT) AZIMUTH = 180\$(DEGREES) \$(0 TRANSMITTANCE = 0.0TO 1), DOE-2 DEFAULT = 0.9 TILT = 17.74(DEGREES), DEFAULT = 90SHADE-SCHEDULE = B-SH-1 .. \$ SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING

BD24 = BUILDING-SHADE

X = 48 Y = 0 Z = 18.5\$COORDINATES HEIGHT = 24\$(FT) WIDTH = 4\$(FT) AZIMUTH = 180\$(DEGREES) TRANSMITTANCE = 0.0\$(0 TO 1), DOE-2 DEFAULT = 0.9 TILT = 17.74(DEGREES), DEFAULT = 90SHADE-SCHEDULE = B-SH-1 .. Ŝ SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING BD25 = BUILDING-SHADEX = 52 Y = 0 Z = 18.5\$COORDINATES HEIGHT = 24\$(FT) WIDTH = 4\$(FT) AZIMUTH = 180\$(DEGREES) TRANSMITTANCE = 0.0\$(0 TO 1), DOE-2 DEFAULT = 0.9 TILT = 17.74(DEGREES), DEFAULT = 90SHADE-SCHEDULE = B-SH-1 .. \$ SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING BD26 = BUILDING-SHADEX = 56 Y = 0 Z = 18.5\$COORDINATES HEIGHT = 24\$(FT) WIDTH = 4\$(FT) AZIMUTH = 180\$(DEGREES)

TRANSMITTANCE = 0.0\$(0 TO 1), DOE-2 DEFAULT = 0.9 TILT = 17.74(DEGREES), DEFAULT = 90SHADE-SCHEDULE = B-SH-1 .. \$ SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING BD27 = BUILDING-SHADEX = 60 Y = 0 Z = 18.5\$COORDINATES HEIGHT = 24\$(FT) WIDTH = 4\$(FT) AZIMUTH = 180\$(DEGREES) TRANSMITTANCE = 0.0\$(0 TO 1), DOE-2 DEFAULT = 0.9 TILT = 17.74(DEGREES), DEFAULT = 90SHADE-SCHEDULE = B-SH-1 .. \$ SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING BD28 = BUILDING-SHADE X = 64 Y = 0 Z = 18.5\$COORDINATES HEIGHT = 24\$(FT) WIDTH = 4\$(FT) AZIMUTH = 180\$(DEGREES) \$(0 TRANSMITTANCE = 0.0TO 1), DOE-2 DEFAULT = 0.9 TILT = 17.74(DEGREES), DEFAULT = 90Ś SHADE-SCHEDULE = B-SH-1 .. SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING

Texas A&M University

BD29 = BUILDING-SHADEX = 68 Y = 0 Z = 18.5\$COORDINATES HEIGHT = 24\$(FT) WIDTH = 4\$(FT) AZIMUTH = 180\$(DEGREES) \$(0 TRANSMITTANCE = 0.0TO 1), DOE-2 DEFAULT = 0.9 TILT = 17.74(DEGREES), DEFAULT = 90SHADE-SCHEDULE = B-SH-1 ... SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING BD30 = BUILDING-SHADE X = 72 Y = 0 Z = 18.5\$COORDINATES HEIGHT = 24\$(FT) WIDTH = 4\$(FT) AZIMUTH = 180\$(DEGREES) TRANSMITTANCE = 0.0\$(0 TO 1), DOE-2 DEFAULT = 0.9 TILT = 17.74(DEGREES), DEFAULT = 90SHADE-SCHEDULE = B-SH-1 ... \$ SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING BD31 = BUILDING-SHADE X = 76 Y = 0 Z = 18.5\$COORDINATES HEIGHT = 24\$(FT) WIDTH = 4\$(FT)

AZIMUTH = 180\$(DEGREES) \$(0 TRANSMITTANCE = 0.0TO 1), DOE-2 DEFAULT = 0.9 TILT = 17.74(DEGREES), DEFAULT = 90SHADE-SCHEDULE = B-SH-1 .. \$ SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING BD32 = BUILDING-SHADE X = 80 Y = 0 Z = 18.5\$COORDINATES HEIGHT = 24\$(FT) WIDTH = 4\$(FT) AZIMUTH = 180\$(DEGREES) TRANSMITTANCE = 0.0\$(0 TO 1), DOE-2 DEFAULT = 0.9 TILT = 17.74(DEGREES), DEFAULT = 90SHADE-SCHEDULE = B-SH-1 .. \$ SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING BD33 = BUILDING-SHADE X = 84 Y = 0 Z = 18.5\$COORDINATES HEIGHT = 24\$(FT) \$(FT) WIDTH = 4AZIMUTH = 180\$(DEGREES) TRANSMITTANCE = 0.0\$(0 TO 1), DOE-2 DEFAULT = 0.9 TILT = 17.74(DEGREES), DEFAULT = 90

SHADE-SCHEDULE = B-SH-1 .. \$ SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING BD34 = BUILDING-SHADE X = 88 Y = 0 Z = 18.5\$COORDINATES HEIGHT = 24\$(FT) \$(FT) WIDTH = 4AZIMUTH = 180\$(DEGREES) TRANSMITTANCE = 0.0\$(0 TO 1), DOE-2 DEFAULT = 0.9 TILT = 17.74(DEGREES), DEFAULT = 90SHADE-SCHEDULE = B-SH-1 .. \$ SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING BD35 = BUILDING-SHADEX = 92 Y = 0 Z = 18.5\$COORDINATES HEIGHT = 24\$(FT) WIDTH = 4\$(FT) AZIMUTH = 180\$(DEGREES) TRANSMITTANCE = 0.0\$(0 TO 1), DOE-2 DEFAULT = 0.9 TILT = 17.74(DEGREES), DEFAULT = 90SHADE-SCHEDULE = B-SH-1 .. \$ SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING BD36 = BUILDING-SHADE X = 96 Y = 0 Z = 18.5\$COORDINATES

HEIGHT = 24 \$(FT) WIDTH = 4 AZIMUTH = 180 \$(DEGREES) TRANSMITTANCE = 0.0 \$(0 TO 1), DOE-2 DEFAULT = 0.9 TILT = 17.74 \$(DEGREES), DEFAULT = 90 SHADE-SCHEDULE = B-SH-1 ... \$ SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING

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\$	* * * * * * * * * * * * * *	* * * * * * * * * * * * * *	DENSITY Specific-Hear	= 120	\$(LB/FT^3) \$(BTU/IB_F)
* * * * * * * * * * * * * * * * * * * *	* * * * * * * * * * * * * *	* * * * * * * * * * * * *	SPECIFIC MEAT	- 0.2	Ϋ́(DIO/ΠD·Γ)
* * * * * * * * * * * * * * * * * * * *	* * * * * * * * * * * * *	*	MIN-WOOL-FIB	= MATERIAL	Ś
			DOE2 1E (FROM REFEREN	TE 2ND PART X I	R 9 MATERIALS
BUILTUP-ROOFING-MAT	= MATERIAL	Ś	LIBRARY)		
DOE2 1E (REFERENCE 2ND	PART X B 2 M	ATERTALS	THICKNESS	= 0.5108	Ś BATT. R-19
LIBRARY)			CONDUCTIVITY	= 0.0250	+ DIIII, IC 19
THICKNESS	= 0.0313	\$ (ፑጥ)	\$ (BTU.FT/HR.FT^2.F)	0.0200	
CONDUCTIVITY	= 0.0939	1 ()	DENSITY	= 0.60	\$(LB/FT^3)
Ś(BTU.FT/HR.FT^2.F)			SPECIFIC-HEAT	= 0.2	\$ (BTU/LB.F)
DENSITY	= 70	\$(LB/FT^3)			1 (= = • , == • = ,
SPECIFIC-HEAT	= 0.35	\$ (BTU/LB_F)	GYPSUM	= MATERIAL	Ś
		(220) 2202)	DOF2.1E(HOLLOW GYPSU	M BOARD FROM RI	EFERENCE 2ND
ROOF-GRAVEL-MAT	= MATERIAL	\$	PART X.B.6 MATERIALS	LIBRARY)	
DOE2.1E(REFERENCE 2ND	PART X.B.7 M	ATERIALS	THICKNESS	= 0.0417	\$(FT)
LIBRARY)			CONDUCTIVITY	= 0.0926	
THICKNESS	= 0.0417	\$(FT)	\$(BTU.FT/HR.FT^2.F)		
			DENSITY	= 49.0	\$(LB/FT^3)
CONDUCTIVITY	= 0.834		SPECIFIC-HEAT	= 0.2	\$(BTU/LB.F)
\$(BTU.FT/HR.FT^2.F)					
DENSITY	= 55	\$(LB/FT^3)	AIR-LAYER-HALF-INCH	= MATERIAL	\$ DOE2.1E(AIR
SPECIFIC-HEAT	= 0.4	\$(BTU/LB.F)	LAYER, ¾ IN. OR LESS	FOR VERTICAL N	WALLS FROM
			REFERENCE 2ND PART X	.B.11 MATERIAL	S LIBRARY)
POLY-EXP =	MATERIAL	\$ DOE2.1E(4	RESISTANCE	= 0.9	
in. FROM REFERENCE 2N	D PART X.B.9 1	MATERIALS	\$(HR.FT^2.F/BTU)		
LIBRARY)					
THICKNESS	= 0.4166	\$(FT)	PLASTIC-FILM-SEAL	= MATERIAL	\$
CONDUCTIVITY	= 0.02		DOE2.1E(BUILDING PAP	ER TYPE FROM RI	EFERENCE 2ND
\$(BTU.FT/HR.FT^2.F)			PART X.B.2 MATERIALS	LIBRARY) REPRI	ESENTING TAR-
DENSITY	= 1.8	\$(LB/FT^3)	PAPER		
SPECIFIC-HEAT	= 0.29	\$(BTU/LB.F)	RESISTANCE	= 0.01	
			\$(HR.FT^2.F/BTU)		
BRICK-4"	= MATERIAL	\$			
DOE2.1E(FROM REFERENCE	E 2ND PART X.	B.2 MATERIALS	PLYWOOD-HALF-INCH	= MATERIAL	\$ DOE2.1E(FROM
LIBRARY)			REFERENCE 2ND PART X	.B.7 MATERIALS	LIBRARY)
THICKNESS	= 0.3333	\$(FT)	THICKNESS	= 0.0417	\$(FT)
CONDUCTIVITY	= 0.4167		CONDUCTIVITY	= 0.0667	
\$(BTU.FT/HR.FT^2.F)			\$(BTU.FT/HR.FT^2.F)		

DENSITY = 34.0 \$(LB/FT^3) CONCRETE-LI-WEIGHT = MATERIAL \$ DOE2.1E(4 SPECIFIC-HEAT $= 0.29 \dots$ \$ (BTU/LB.F) IN., 80 LB. FROM REFERENCE 2ND PART X.B.5 MATERIALS LIBRARY) SOFT-WOOD = MATERIAL \$ DOE2.1E(3/4 THICKNESS = 0.33 \$(FT) IN. FROM REFERENCE 2ND PART X.B.8 MATERIALS CONDUCTIVITY = 0.2083LIBRARY) \$(BTU.FT/HR.FT^2.F) THICKNESS = 0.0625\$(FT) DENSITY = 80.0 \$(LB/FT^3) SPECIFIC-HEAT = 0.2 ... CONDUCTIVITY = 0.0667\$(BTU/LB.F) \$(BTU.FT/HR.FT^2.F) DENSITY = 34 \$(LB/FT^3) POLY-EXP-2 = MATERIAL \$ DOE2.1E(4 SPECIFIC-HEAT = 0.33 .. \$(BTU/LB.F) in. FROM REFERENCE 2ND PART X.B.9 MATERIALS LIBRARY) SOIL-12IN = MATERIAL \$ SOIL LAYER THICKNESS = 0.3333\$(FT) (FROM BUILDING ENERGY SIMULATION VOL. 23, No.6, CONDUCTIVITY = 0.02PAGES 21-22 WINKELMANN MEMO) \$(BTU.FT/HR.FT^2.F) THICKNESS = 1.8 \$(LB/FT^3) = 1.0\$(FT) DENSITY CONDUCTIVITY = 1.0 SPECIFIC-HEAT = 0.29 .. \$(BTU/LB.F) \$(BTU.FT/HR.FT^2.F) DENSITY = 115\$(LB/FT^3) MINERAL-WOOL1 = MATERIAL SPECIFIC-HEAT = 0.1 .. \$(BTU/LB.F) \$DOE2.1E(MATERIALS LIBRARY, REFERENCED FROM IECC1107 FILE) CONCRETE-HE-WEIGHT = MATERIAL \$ DOE2.1E(4 = 0.2917THICKNESS \$(FT) = 0.027IN., DRIED AGGREGATE, 140 LB. FROM REFERENCE 2ND CONDUCTIVITY PART X.B.3 MATERIALS LIBRARY) \$(BTU.FT/HR.FT^2.F) \$(FT) = 0.6 \$(LB/FT^3) THICKNESS = 0.33DENSITY CONDUCTIVITY = 0.7576SPECIFIC-HEAT = 0.2 .. \$(BTU/LB.F) \$(BTU.FT/HR.FT^2.F) DENSITY = 140.0\$(LB/FT^3) SOFT-WOOD1 = MATERIAL = 0.2 ... \$DOE2.1E (MATERIALS LIBRARY, REFERENCED FROM SPECIFIC-HEAT \$(BTU/LB.F) IECC1107 FILE) CONCRETE-BLOCK-8" = MATERIAL \$ = 0.2083THICKNESS \$(FT) = 0.0667 DOE2.1E (CONCRETE FILLED FROM REFERENCE 2ND PART CONDUCTIVITY \$(BTU.FT/HR.FT^2.F) X.B.6 MATERIALS LIBRARY) THICKNESS = 0.6667 \$(FT) DENSITY = 32 \$(LB/FT^3) CONDUCTIVITY = 0.4359SPECIFIC-HEAT = 0.33 .. \$(BTU/LB.F) \$(BTU.FT/HR.FT^2.F) = 115.0 \$(LB/FT^3) \$ DENSITY = 0.2 .. SPECIFIC-HEAT \$(BTU/LB.F)

WA - 1 - 2= LAYERS \$ LAYERS FOR THE EXTERIOR WALL CONSTRUCTION INSIDE-FILM-RES = 0.6800\$ HR-SOFT-F /BTU (REFERENCE FROM IECC1107) MATERIAL = (AIR-LAYER-HALF-INCH, BRICK-4", PLASTIC-FILM-SEAL, PLYWOOD-HALF-INCH, MIN-WOOL-FIB, GYPSUM, AIR-LAYER-HALF-INCH).. \$ MATERIALS FROM OUTSIDE TO INSIDE WA-1-3 = LAYERS \$ LAYERS FOR THE EXTERIOR WALL CONSTRUCTION INSIDE-FILM-RES = 0.6800\$ HR-SOFT-F /BTU (REFERENCE FROM IECC1107) = (POLY-EXP-2, CONCRETE-LI-MATERIAL

ROO-1 = LAYERS \$ LAYERS FOR THE ROOF CONSTRUCTION INSIDE-FILM-RES = 0.76 \$ HR-SQFT-F /BTU (REFERENCE FROM IECC1107) MATERIAL = (ROOF-GRAVEL-MAT, BUILTUP-ROOFING-MAT, POLY-EXP, SOFT-WOOD).. \$ MATERIALS FROM OUTSIDE TO INSIDE

WEIGHT).. \$ MATERIALS FROM OUTSIDE TO INSIDE

DOOR-LAY1 = LAYERS \$ REFERENCED FROM IECC1107 FILE MATERIAL = (GYPSUM, MINERAL-WOOL1, SOFT-WOOD1, GYPSUM) ..

Ś \$ * * * * * CONSTRUCTIONS * * * * * * * * * * Ś WALL-1 = CONSTRUCTION \$ EXTERIOR WALL CONSTRUCTION (LAYERED CONSTRUCTION) LAYERS = WA-1-2 \$ LAYERS OF THE EXTERIOR WALL CONSTRUCTION ABSORPTANCE = 0.7000\$ DOE-2.1E DEFAULT FROM REFERENCE PT1 III.47 \$ DOE-2.1E ROUGHNESS = 3.0000. . DEFAULT FROM REFERENCE PT1 III.47 = CONSTRUCTION \$ EXTERIOR WALL-2 WALL CONSTRUCTION (LAYERED CONSTRUCTION) LAYERS = WA - 1 - 3\$ LAYERS OF THE EXTERIOR WALL CONSTRUCTION ABSORPTANCE = 0.7000\$ DOE-2.1E DEFAULT FROM REFERENCE PT1 III.47 ROUGHNESS = 3.0000\$ DOE-2.1E . . DEFAULT FROM REFERENCE PT1 III.47 ROOF-1 = CONSTRUCTION \$ ROOF CONSTRUCTION (LAYERED CONSTRUCTION) LAYERS = R00 - 1\$ LAYERS OF THE ROOF CONSTRUCTION (LAYERED CONSTRUCTION) ABSORPTANCE = 0.7000\$ DOE-2.1E DEFAULT FROM REFERENCE PT1 III.47

ROUGHNESS = 3.0000 $$ DOE-2.1E$	VIS-TRANS = 0.9000 \$ FROM
DEFAULT FROM REFERENCE PT1 III.47	THE WINDOWS-5 LIBRARY
	INSIDE-EMISS = 0.8400 \$ FROM
DOOR-1 = CONSTRUCTION \$ REFERENCED	THE WINDOWS-5 LIBRARY
FROM IECC1107 FILE)	OUTSIDE-EMISS = 0.8400 \$ FROM
LAYERS = DOOR-LAY1	THE WINDOWS-5 LIBRARY
$U = 0.2 \dots $ \$ IECC	SPACER-TYPE-CODE = 1.0000 \$ FROM
2001(RESIDENTIAL BUILDING)(BTU/HR.FT^2.F)	THE WINDOWS-5 LIBRARY (ALUMINIUM)
	FRAME-ABS = 0.7000 \$ FROM
\$	THE WINDOWS-5 LIBRARY
******************	CONVERGENCE-TOL = 0.0000 \$ FROM
***************************************	THE WINDOWS-5 LIBRARY

\$	W-2 = GLASS-TYPE
******************	\$ CUSTOM WINDOW FOR UPPER SOUTH FRONT WALL
**** WINDOWS/DOORS	WINDOWS (WINDOWS-5)
******************	GLASS-TYPE-CODE = 2001 \$ GLASS
* * * * * * * * * * *	TYPE CODE
\$	PANES = 1.0000 \$ FROM
******************	THE WINDOWS-5 LIBRARY
******************	GLASS-CONDUCTANC = 1.4700 \$ FROM
* * * * * * * * * * * * * * * * * * * *	THE WINDOWS-5 LIBRARY
	VIS-TRANS = 0.9000 \$ FROM
\$ THE SIMULATION TOOL (DOE-2.1E) CAN ACCEPT	THE WINDOWS-5 LIBRARY
CUSTOM WINDOWS DESIGNED USING WINDOWS-5 (LBNL)	INSIDE-EMISS = 0.8400 \$ FROM
PROGRAM AS A	THE WINDOWS-5 LIBRARY
\$ REASON WINDOWS AND DOORS ARE MODELED USING	OUTSIDE-EMISS = 0.8400 \$ FROM
WINDOWS-5 (LBNL) PROGRAM FOR CONSISTANCY .	THE WINDOWS-5 LIBRARY
	SPACER-TYPE-CODE = 1.0000 \$ FROM
W-1 = GLASS-TYPE	THE WINDOWS-5 LIBRARY (ALUMINIUM)
\$ CUSTOM WINDOW FOR LOWER SOUTH FRONT WALL AND	FRAME-ABS = 0.7000 \$ FROM
BACK WINDOWS (WINDOWS-5)	THE WINDOWS-5 LIBRARY
GLASS-TYPE-CODE = 2001 \$ GLASS	CONVERGENCE-TOL = 0.0000 \$ FROM
TYPE CODE	THE WINDOWS-5 LIBRARY
PANES = 1.0000 \$ FROM	
THE WINDOWS-5 LIBRARY	\$
GLASS-CONDUCTANC = 1.4700 \$ FROM	****************
THE WINDOWS-5 LIBRARY	* * * * * * * * * * * * * * * * * * * *

\$											
***** OCCUF	**************************************	* * * * * * * * * * * * * * * * *	LT-1	=DAY-SCHEDULE	(1,8) $(0.05)(9.18)$ (1.0)						
***********	******	* * * * * * * * * * * * * * * * *	SOFFICE2 LIGHT	ING SCHEDULE HAS I	BEEN SET TO ONE						
* * * * *			DURING OFFICE	HOURS							
Ś			Doming office		(19 24)						
**********	* * * * * * * * * * * * * * * * * * * *	* * * * * * * * * * * * * * * * *	(0.05).								
* * * * * * * * * * * * *	* * * * * * * * * * * * * * * * * * * *	* * * * * * * * * * * * * * * * *	(0.03)								
* * * * * * * * * * * * *	* * * * * * * * * * * * * * * * * * * *	* * * *	T.T2	=DAY-SCHEDIILE	(1 24) (0 05)						
				DITI DETIDUDID	(1,21) (0.00)						
OC-1	= DAY-SCHEDULE	(1, 8) $(0, 0)$	••								
001		(9,11) $(1,0)$	I.T-WEEK	=WEEK-SCHEDILLE	(MON_FRI) I.T-						
		(12, 14)	1 (WEH) LT-2								
(0 8 0 4 0 8)		(12)11)		••							
(0.0,0.1,0.0)		(15.18) (1.0)	LIGHTS-1	=SCHEDULE	THRU DEC 31						
		(10, 20) $(10, 21)$	LT-WEEK	Sourcest							
(0, 5, 0, 1, 0, 1)		(1),21)									
(0.0,0.1,0.1)		(22, 24) $(0, 0)$	Ś								
		(22,21) (0.0)	,	* * * * * * * * * * * * * * * * * * * *	* * * * * * * * * * * * * * * * *						
0C-2	= DAY-SCHEDULE	(1, 24) $(0, 0)$	* * * * * * * * * * * * * * *	* * * * * * * * * * * * * * * * * * * *	* * * * * * * * * * * * * * * * *						
	2111 20112022		* * * * * * * * * * * * * * *	* * * * * * * * * * * * * * * * * * *	* * * *						
OC-WEEK	= WEEK-SCHEDULE	(WD) OC-1 (WEH)	\$								
OC-2			* * * * * * * * * * * * * * *	* * * * * * * * * * * * * * * * * * *	* * * * * * * * * * * * * * * *						
OCCUPY-1	= SCHEDULE	THRU DEC 31 OC-	**** EOUIPM	ENT SCHEDULE							
WEEK			*********	* * * * * * * * * * * * * * * * * * * *	* * * * * * * * * * * * * * * *						
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\$											
· * * * * * * * * * * * * *	* * * * * * * * * * * * * * * * * * * *	* * * * * * * * * * * * * * * * *	EO-1	=DAY-SCHEDULE	(1,8) (0.02)						
**** LIGHI	ING SCHEDULE		~		(9,14)						
* * * * * * * * * * * * *	* * * * * * * * * * * * * * * * * * * *	* * * * * * * * * * * * * * * * *	(0.4,0.9,0.9,0	.9,0.9,0.9)							
* * * * * *					(15, 20)						
\$			(0.8,0.7,0.5,0	.5,0.3,0.3)	· · · ·						
********	* * * * * * * * * * * * * * * * * * * *	* * * * * * * * * * * * * * * * *		,	(21,24) (0.02)						
* * * * * * * * * * * * *	* * * * * * * * * * * * * * * * * * * *	* * * * * * * * * * * * * * * * *									
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EQ-2	=DAY-SCHEDULE	(1,24) (0.2)	\$						
			* * * * * * * * * * * * * * *	* * * * * * * * * * * * * * * * * * * *					
EQ-WEEK	=WEEK-SCHEDULE	(MON,FRI) EQ-1	* * * * * * * * * * * * * *	* * * * * * * * * * * * * * * * * * * *					
(WEH) EQ-2			* * * * * * * * * * * * * *	****					
EOUIP-1	=SCHEDULE	THRU DEC 31	\$						
EO-WEEK			· * * * * * * * * * * * * * * *	*****					
~			**** SPECIF	IC SPACE DETAILS					
\$			* * * * * * * * * * * * * *	****					
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**** INFI	LTRATION SCHEDULE		* * * * * * * * * * * * * * * * * * * *						
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			* * * * *	SPACE1-1					
			* * * * * * * * * * * * * *	*****					
\$			* *						
****	* * * * * * * * * * * * * * * * * * * *	* * * * * * * * * * * * * * * * *	\$						
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\$			* * * * * * * * * * * * * *	****					
· * * * * * * * * * * * * *	* * * * * * * * * * * * * * * * * * * *	* * * * * * * * * * * * * * * * *							
**** GENE	RAL SPACE DEFINITION	15	SPACE1-1	= SPACE					
*****	* * * * * * * * * * * * * * * * * * * *	* * * * * * * * * * * * * * * *	ZONE-TYPE	= CONDITIONED \$ DOE2					
\$			DEFAULTS						
* * * * * * * * * * * *	* * * * * * * * * * * * * * * * * * * *	* * * * * * * * * * * * * * * * *	AREA	= 5000					
*****	* * * * * * * * * * * * * * * * * * * *	* * * * * * * * * * * * * * * * *	VOLUME	= 70000					
* * * * * * * * * * * *	* * * * * * * * * * * * * * * * * * * *	* * * *	Х	= 0.0000					

= SPACE-CONDITIONS

************************ * * * * * * * * * * * * * * * ***** -1 * * * * * * * * * * * * * * * = SPACE = CONDITIONED \$ DOE2 = 5000 = 70000 = 0.0000 = 0.0000\$ DOE2

= 10.0000

\$ DOE2

Y

Ζ

DEFAULTS

DEFAULTS

AZIMUTH	= 0.0000	\$	DOE2	DAYLIGHTING = YES \$ DAYLIGHING
DEFAULTS				OPTION IS SWITCHED ON
MULTIPLIER	= 1.0000	\$	DOE2	LIGHT-REF-POINT1 = $(25, 25, 2.7)$ \$ LOCATION OF
DEFAULTS				THE FIRST DAYLIGHT SENSOR
FLOOR-WEIGHT	= 70	\$	IECC	LIGHT-REF-POINT2 = (75, 25, 2.7) \$ LOCTION OF
2001,402.1.3.3,DOE2	2 DEFAULTS IS 7	0		THE SECOND DAYLIGHT SENSOR
NUMBER-OF-PEOPLE	= 50			ZONE-FRACTION1 = 0.5 \$ FRACTION OF
PEOPLE-SCHEDULE	= OCCUPY-1			THE ZONE CONTROLLED BY SENSOR 1
PEOPLE-HEAT-GAIN	= 400	\$	DOE2	ZONE-FRACTION2 = 0.5 \$ FRACTION OF
DEFAULTS				THE ZONE CONTROLLED BY SENSOR 2
PEOPLE-HG-LAT	= 130.3	\$	DOE2	LIGHT-SET-POINT1 = 50 \$ TARGET
DEFAULTS				ILLUMINATION (FC) REQUIRED AT SENSOR 1
PEOPLE-HG-SENS	= 252.2	Ş	DOE2	LIGHT-SET-POINT2 = 50 \$ TARGET
DEFAULTS				ILLUMINATION (FC) REQUIRED AT SENSOR 2
EQUIP-SCHEDULE	= EQUIP-1			LIGHT-CTRL-TYPE1 = CONTINUOUS \$ TYPE OF
EQUIPMENT-W/SQFT	= 1	\$	DOE2	LIGHTING CONTROL FOR PORTRION OF ZONE AREA
DEFAULTS				CONTROLLED BY SENSOR 1
AIR-CHANGES/HR	= 0.25	\$	DOE2	LIGHT-CTRL-TYPE2 = CONTINUOUS \$ TYPE OF
DEFAULTS				LIGHTING CONTROL FOR PORTRION OF ZONE AREA
TEMPERATURE	= (73)	\$	DOE2	CONTROLLED BY SENSOR 2
DEFAULTS				MIN-POWER-FRAC = 0 \$ LOWEST
SOURCE-TYPE	= ELECTRIC	\$	DOE2	INPUT POWER FRACTION FOR CONTINUOUSLY DIMMABLE
DEFAULTS				LIGHING CONTROL SYSTEM
SOURCE-POWER	= 0.0000	\$	DOE2	MIN-LIGHT-FRAC = 0 \$ SPECIFIES
DEFAULTS				THE FRACTIONAL LIGHT OUTPUT THAT A CONTINUOUSLY
EQUIP-LATENT	= 0.0000	\$	DOE2	DIMNMABLE
DEFAULTS				\$ LIGHTING
EQUIP-SENSIBLE	= 1.0000	Ş	DOE2	CONTROL SYSTEM PRODUCES AT THE MINIMUM
DEFAULTS				FRACTIONAL INPUT POWER GIVEN BY MIN-POWER-FRAC
SOURCE-LATENT	= 0.5	\$	DOE2	
DEFAULTS				FRONT-1 = EXTERIOR-WALL
SOURCE-SENSIBLE	= 0.4	Ş	DOE2	HEIGHT = 8
DEFAULTS				WIDTH $= 100$
FLOOR-MULTIPLIER	= 1.0000	Ş	DOE2	X = 0
DEFAULTS				Y = 0
LIGHTING-SCHEDULE	= LIGHTS-1			Z = 0
LIGHTING-TYPE	= REC-FLUOR-1	RV		AZIMUTH = 180
LIGHT-TO-SPACE	= 0.80			CONSTRUCTION = WALL-1
LIGHTING-W/SOFT	= 1.5			
···, ~ <u>x</u>				

\$ FRACTION OF

TILT	= 90.0000	\$ DOE2			
DEFAULTS			DR-1	= DOC	R \$ (REFERENCED FROM
			IECC1107 FILE)		
WF-1	= WINDOW		WIDTH	= 3	
WIDTH	= 45		HEIGHT	= 7	
HEIGHT	= 4.0000		Х	= 25	
Х	= 52.5		Y	= 0	
Y	= 3.0000		SETBACK = 0.0		\$(FT)
GLASS-TYPE :	= W-1		CONSTRUCTION	= DOC	DR-1
			\$MULTIPLIER	=	UNUSED
FRONT-2	= EXTERIOR-WALL		\$OVERHANG-A	= 0.0	DOE-2
HEIGHT	= 8		DEFAULT, UNUSED (FT)		
WIDTH	= 100		\$OVERHANG-B	= 0.0	DOE-2
Х	= 0		DEFAULT, UNUSED (FT)		
Y	= 25		\$OVERHANG-W	= 0.0	DOE-2
Z	= 16		DEFAULT, UNUSED (FT)		
AZIMUTH	= 180		\$OVERHANG-D	= 0.0	DOE-2
CONSTRUCTION	= WALL-1		DEFAULT, UNUSED (FT)		
TILT	= 90.0000	\$ DOE2	\$OVERHANG-ANGLE	= 0.0	DOE-2
DEFAULTS			DEFAULT, UNUSED (DEGREE	ES)	
			\$LEFT-FIN-A	= 0.0	DOE-2
WF-2	= WINDOW		DEFAULT, UNUSED (FT)		
WIDTH	= 90		\$LEFT-FIN-B	= 0.0	DOE-2
HEIGHT	= 3.0000		DEFAULT, UNUSED (FT)		
Х	= 5		\$LEFT-FIN-H	= 0.0	DOE-2
Y	= 4.0000		DEFAULT, UNUSED(FT)		
GLASS-TYPE	= W-2		\$LEFT-FIN-D	= 0.0	DOE-2
			DEFAULT, UNUSED(FT)		
PR1 ·	= POLYGON \$ FROM		\$RIGHT-FIN-A	= 0.0	DOE-2
DOCUMENTATION UPDATE	PACKAGE #2 PAGE 2	2.129	DEFAULT, UNUSED(FT)		
			\$RIGHT-FIN-B	= 0.0	DOE-2
			DEFAULT, UNUSED(FT)		
(100,0,0) $(100,50,0)$ $(1$	00,50,8)(100,25,2	24)	\$RIGHT-FIN-H	= 0.0	DOE-2
(100,25,16) (100,0,8)			DEFAULT, UNUSED(FT)		
RIGHT-1 = EXTERIOR-WA	LL POLYGON = PR	R1	\$RIGHT-FIN-D	= 0.0	DOE-2
Х	= 100		DEFAULT, UNUSED(FT)		
Y	= 0		\$INF-COEF	= 0.0) USED IF
Z	= 0		INFILTRATION METHOD=0	CRACK ((O TO 160)
CONSTRUCTION	= WALL-1				

SKY-FORM-FACTOR = 0.5 **\$ARBITRARY** \$RIGHT-FIN-H = 0.0 DOE-2 VALUE(0 TO 1) DEFAULT, UNUSED (FT) = 0.5 = 0.0 DOE-2 GND-FORM-FACTOR \$ARBITRARY \$RIGHT-FIN-D VALUE(0 TO 1) DEFAULT, UNUSED (FT) = 10 \$SHADING-DIVISIONS \$INF-COEF = 0.0USED IF INSIDE-VIS-REFL = 0.0 . . \$DOE-2 INFILTRATION METHOD=CRACK(0 TO 160) DEFAULT, FOR DAYLIGHTING CALC(0 TO 1) SKY-FORM-FACTOR = 0.5\$ARBITRARY VALUE(0 TO 1) DR-2 = DOOR \$ (REFERENCED FROM GND-FORM-FACTOR = 0.5**\$ARBITRARY** IECC1107 FILE) VALUE(0 TO 1) WIDTH = 3 \$SHADING-DIVISIONS = 10 = 7 HEIGHT INSIDE-VIS-REFL = 0.0. . \$DOE-2 Х = 22 DEFAULT, FOR DAYLIGHTING CALC(0 TO 1) Υ = 0 SETBACK = 0.0\$(FT) = EXTERIOR-WALL BACK-1 CONSTRUCTION HEIGHT = 8 = DOOR-1 \$MULTIPLIER WIDTH = 100= UNUSED \$OVERHANG-A = 0.0DOE-2 Х = 100DEFAULT, UNUSED (FT) Υ = 50 = 0 \$OVERHANG-B = 0.0DOE-2 Ζ = 0 DEFAULT, UNUSED (FT) AZIMUTH = 0.0DOE-2 \$OVERHANG-W CONSTRUCTION = WALL-1 = 90.0000DEFAULT, UNUSED (FT) TILT . . \$DEGREES \$OVERHANG-D = 0.0DOE-2 DEFAULT, UNUSED (FT) WB-1 = WINDOW DOE-2 \$OVERHANG-ANGLE = 0.0WIDTH = 24 DEFAULT, UNUSED (DEGREES) HEIGHT = 4.0000\$LEFT-FIN-A = 0.0 DOE-2 Х = 11 = 3.0000DEFAULT, UNUSED (FT) Υ \$LEFT-FIN-B = 0.0DOE-2 GLASS-TYPE = W - 1 ...DEFAULT, UNUSED (FT) \$LEFT-FIN-H = 0.0DOE-2 WB-2 = WINDOW DEFAULT, UNUSED (FT) WIDTH = 24 \$LEFT-FIN-D = 0.0DOE-2 HEIGHT = 4.0000DEFAULT, UNUSED (FT) Х = 65 \$RIGHT-FIN-A = 0.0DOE-2 Υ = 3.0000= W - 1 ...DEFAULT, UNUSED (FT) GLASS-TYPE = 0.0\$RIGHT-FIN-B DOE-2DEFAULT, UNUSED (FT)

PL1	= POLYGON \$	FROM	\$LEFT-FIN-D	= 0.0	DOE-2
DOCUMENTATION UPDATE	PACKAGE #2 1	PAGE 2.129	DEFAULT, UNUSED(FT)		
			\$RIGHT-FIN-A	= 0.0	DOE-2
			DEFAULT, UNUSED(FT)		
(0, 50, 0) (0, 0, 0) (0, 0, 0)	8)(0,25,16)		\$RIGHT-FIN-B	= 0.0	DOE-2
(0,25,24)(0,50,8)	••		DEFAULT, UNUSED(FT)		
LEFT-1	= EXTERIOR-N	WALL POLYGON =	\$RIGHT-FIN-H	= 0.0	DOE-2
PL1			DEFAULT, UNUSED(FT)		
Х	= 0		\$RIGHT-FIN-D	= 0.0	DOE-2
Y	= 50		DEFAULT, UNUSED(FT)		
Z	= 0		\$INF-COEF	= 0.0	USED IF
CONSTRUCTION	= WALL-1		INFILTRATION METHOD	CRACK (0 TO 1	60)
			SKY-FORM-FACTOR	= 0.5	\$ARBITRARY
DR-3	= DOOR \$(RE)	FERENCED FROM	VALUE(0 TO 1)		
IECC1107 FILE)			GND-FORM-FACTOR	= 0.5	\$ARBITRARY
WIDTH	= 3		VALUE(0 TO 1)		
HEIGHT	= 7		\$SHADING-DIVISIONS	= 10	
Х	= 25		INSIDE-VIS-REFL	= 0.0	\$DOE-2
Y	= 0		DEFAULT, FOR DAYLIGH	TING CALC(0 T	0 1)
SETBACK = 0.0		\$(FT)	,	,	,
CONSTRUCTION	= DOOR-1		DR-4	= DOOR \$(RE	FERENCED FROM
\$MULTIPLIER	=	UNUSED	IECC1107 FILE)		
\$OVERHANG-A	= 0.0	DOE-2	WIDTH	= 3	
DEFAULT, UNUSED (FT)			HEIGHT	= 7	
\$OVERHANG-B	= 0.0	DOE-2	Х	= 22	
DEFAULT, UNUSED (FT)			Y	= 0	
\$OVERHANG-W	= 0.0	DOE-2	SETBACK = 0.0		\$(FT)
DEFAULT, UNUSED (FT)			CONSTRUCTION	= DOOR-1	
\$OVERHANG-D	= 0.0	DOE-2	\$MULTIPLIER	=	UNUSED
DEFAULT, UNUSED (FT)			\$OVERHANG-A	= 0.0	DOE-2
\$OVERHANG-ANGLE	= 0.0	DOE-2	DEFAULT, UNUSED (FT)		
DEFAULT, UNUSED (DEGRE	ES)		\$OVERHANG-B	= 0.0	DOE-2
\$LEFT-FIN-A	= 0.0	DOE-2	DEFAULT, UNUSED (FT)		-
DEFAULT, UNUSED (FT)			\$OVERHANG-W	= 0.0	DOE-2
\$LEFT-FIN-B	= 0.0	DOE-2	DEFAULT, UNUSED (FT)		
DEFAULT, UNUSED (FT)			\$OVERHANG-D	= 0.0	DOE-2
\$LEFT-FIN-H	= 0.0	DOE-2	DEFAULT, UNUSED (FT)		
DEFAULT, UNUSED (FT)		-	\$OVERHANG-ANGLE	= 0.0	DOE-2
			DEFAULT, UNUSED (DEGR	EES)	
<pre>\$OVERHANG-B DEFAULT, UNUSED (FT) \$OVERHANG-W DEFAULT, UNUSED (FT) \$OVERHANG-D DEFAULT, UNUSED (FT) \$OVERHANG-ANGLE DEFAULT, UNUSED (DEGRE \$LEFT-FIN-A DEFAULT, UNUSED (FT) \$LEFT-FIN-B DEFAULT, UNUSED (FT) \$LEFT-FIN-H DEFAULT, UNUSED (FT)</pre>	= 0.0 $= 0.0$ $= 0.0$ $= 0.0$ $= 0.0$ $= 0.0$ $= 0.0$	DOE-2 DOE-2 DOE-2 DOE-2 DOE-2 DOE-2 DOE-2 DOE-2	X Y SETBACK = 0.0 CONSTRUCTION \$MULTIPLIER \$OVERHANG-A DEFAULT, UNUSED(FT) \$OVERHANG-B DEFAULT, UNUSED(FT) \$OVERHANG-W DEFAULT, UNUSED(FT) \$OVERHANG-D DEFAULT, UNUSED(FT) \$OVERHANG-ANGLE DEFAULT, UNUSED(DEGR	= 22 = 0 = DOOR-1 = = 0.0 = 0.0 = 0.0 = 0.0 = 0.0 EES)	\$(FT) UNUSED DOE-2 DOE-2 DOE-2 DOE-2 DOE-2 DOE-2

\$LEFT-FIN-A	= 0.0	DOE-2	HEIGHT	= 30.39
DEFAULT, UNUSED (FT)	- 0 0	DOE 2	WIDTH V	= 104
STELL-LIN-D	- 0.0	DOE-2	A V	2 05
SIERE EIN H	- 0 0	DOE 2	1	
STELL-LIN-U	- 0.0	DOE-2		- 0.75
SIFET-FIN-D	- 0 0			-100
STELL-LIN-D	- 0.0	DOE-2	CONSTRUCTION	- 17.7400 $C DOE2$
DEFAULT, UNUSED (FT)	- 0 0			= 17.7400 $3 DOE2$
SRIGHT-FIN-A	= 0.0	DOE-2	DEFAULTS	
DEFAULT, UNUSED (FT)	- 0 0			
SRIGHI-FIN-B	= 0.0	DOE-2		= EXTERIOR-WALL
DEFAULT, UNUSED (FT)	0 0		HEIGHT	= 36.35
SRIGHT-FIN-H	= 0.0	DOE-2	WIDTH	= 104
DEFAULT, UNUSED (FT)	0 0	505.0	X	= 102
SRIGHT-FIN-D	= 0.0	DOE-2	Y -	= 52.25
DEFAULT, UNUSED (FT)	0.0		'Z	= 6.55
SINF-COEF	= 0.0	USED IF	AZIMUTH	= 0
INFILTRATION METHOD=	CRACK(0 TO 160)	CONSTRUCTION	= ROOF-1
SKY-FORM-FACTOR	= 0.5	ŞARBITRARY	TILT	$= 32.6200 \dots $ \$ DOE2
VALUE(0 TO 1)			DEFAULTS	
GND-FORM-FACTOR	= 0.5	ŞARBITRARY		
VALUE(0 TO 1)			\$HOURLY REPORTS-	\$
\$SHADING-DIVISIONS	= 10			
INSIDE-VIS-REFL	= 0.0	\$DOE-2	PLTSCH = SCHEDULE	THRU FEB 3 (ALL) (1,24) (1)
DEFAULT, FOR DAYLIGHT	ING CALC(0 TO	1)		THRU AUG 25 (ALL) (1,24)
			(1)	
FLOOR-1	= EXTERIOR-WA	LL		THRU DEC 31 (ALL) (1,24)
HEIGHT	= 50		(1)	
WIDTH	= 100			
Х	= 0		PLOTER1 = REPORT-BLC	OCK
Y	= 50		VARIABLE-I	YPE = GLOBAL
Z	= 0		VARIABLE-I	$JIST = (1, 4, 6) \dots $
AZIMUTH	= 180		CLEARNESS NUMBER, DR	RY BULB TEMPERATURE (°F),
CONSTRUCTION	= WALL-2		CLOUD AMOUNT (0 TO 1	0) FROM REFERENCE PT1
TILT	= 180.0000	••• \$	III.101	
REFERENCE FROM BUILD	ING ENERGY SIM	ULATION VOL.		
23, No.6, PAGE 21 WI	NKELMANN MEMO		PLOTER2 = REPORT-BLC VARIABLE-T	OCK YPE = BUILDING
TOP-1	= EXTERIOR-WA	LL		

(1,24) (78) ...

VARIABLE-LIST = (1, 2, 19, 20, 37) HEAT-2 = DAY-SCHEDULE (1,24) (68) \$ BUILDING HEATING LOAD (SENSIBLE), BUILDING HEAT-WEEK =WEEK-SCHEDULE (MON, FRI) HEAT-1 HEATING LOAD (LATENT), BUILDING COOLING LOAD (WEH) HEAT-2 .. (SENSIBLE), BUILDING COOLING LOAD (LATENT), HEAT-SCHED =SCHEDULE THRU DEC 31 HEAT-BUILDING ELECTRIC TOTAL FROM REFERENCE PT1 WEEK .. III.103 AND III.104 COOLOFF =SCHEDULE THRU DEC 31 (ALL) (1,24) (1) ... THRU DEC 31 (ALL) LDS-REP-1 = HOURLY-REPORTHEATOFF =SCHEDULE REPORT-SCHEDULE = PLTSCH (1,24) (1) .. REPORT-BLOCK = (PLOTER1, PLOTER2) OPTION = PRINT .. COOL-1 =DAY-SCHEDULE COOL-2 =DAY-SCHEDULE (1,24) (78) ... END .. COOL-WEEK =WEEK-SCHEDULE (MON, FRI) COOL-1 COMPUTE LOADS .. (WEH) COOL-2 .. COOL-SCHED =SCHEDULE THRU DEC 31 COOL-INPUT SYSTEMS INPUT-UNITS = ENGLISH WEEK .. \$DOE-2 DEFAULT (OR METRIC) R1 =DAY-RESET-SCH SUPPLY-HI=60 OUTPUT-UNITS = ENGLISH ... \$DOE-2 DEFAULT (OR METRIC) SUPPLY-LO=52 OUTSIDE-LO=30 OUTSIDE-HI=75 ... SYSTEMS-REPORT SUMMARY = (ALL-SAT-RESET =RESET-SCHEDULE THRU DEC 31 (ALL) SUMMARY) R1 .. VERIFICATION = (SV-A) REPORT-FREQUENCY \$ SYSTEM DESCRIPTION = HOURLY ZAIR =ZONE-AIR OA-CFM/PER=0 ... HOURLY-DATA-SAVE = NO-SAVE .. CONTROL =ZONE-CONTROL DESIGN-HEAT-T=70 \$ SYSTEMS SCHEDULES DESIGN-COOL-T=76 HEAT-TEMP-SCH= HEAT-FAN-1 =DAY-SCHEDULE (1,24) (1) SCHED COOL-TEMP-SCH= COOL-. .

(1, 24) (1)

THRU DEC 31

SCHED

TYPE=REVERSE-ACTION ...

\$ FOLLOWING AIR FLOWS ARE HEAT-1 =DAY-SCHEDULE (1,24) (68) .. FROM RUN 3 SV-A REPORT,

THERMOSTAT-

August 2012

FAN-2

. .

=DAY-SCHEDULE

FAN-SCHED =SCHEDULE

(WD) FAN-1 (WEH) FAN-2 ...

	\$ DIVIDED BY ALTITUDE				SUPPLY-STATIC=2.0
MULTIPLIER			SUPPLY-EFF=.	55	
SPACE1-1 =ZONE	ZONE-AIR=ZAIR		CTRL=CYCLE-O	N-ANY	NIGHT-CYCLE-
CONTROL	ZONE-CONTROL	=	S-TERM	=SYSTEM-TERMINAL	REHEAT-DELTA-T=58
CONTROL	ZONE-TYPE	=			
CONDITIONED	ΒΛ ϚϜΒΛΛ ΡΡ-ΡΛΨΙΝΟ	_	avam_1	- GV GTTEM	
0.00 \$ BTU/HR	DASEBOARD-RAIING	_	5151-1	-5151EM	SUPPLY-CFM
0.00 \$ BTU/BT	U V	=	= /366		SYSTEM-CONTROL
0.75 \$ FRAC. OR MU	EXHAUST-EFF LT.	=	= S-CONT		SYSTEM-FANS
OUTDOOR-RESET	BASEBOARD-CTRL	=	= S-FAN		SYSTEM-TERMINAL
1.00 \$ R	THROTTLING-RANGE	=	= S-TERM		ECONO-LIMIT-T
0.0003 \$ KW/CFM	ZONE-FAN-KW/FLOW	=	= 65		ZONE-NAMES
CV/AV	TERMINAL-TYPE	=	= (SPACE1-1)		UEAT-SOUDCE
SVAV	ZONE-REPORTS	=	= ELECTRIC		HEAI-SOURCE
YES			= ELECTRIC		ZONE-HEAT-SOURCE
S-CONT =SYSTEM	-CONTROL COOLING-SCHEDU	LE=			PREHEAT-SOURCE
COOLOFF	HEATING-SCHEDU	LE=	- ELECIRIC		BASEBOARD-SOURCE
HEATOFF	HEAT-SET-T=65		= ELECTRIC		VARIABLE-T
	COOL-CONTROL=R COOL-RESET-	ESET	= ON		SIZING-RATIO
SCH=SAT-RESET		0	= 1.00 \$ DOE	-2.1 DEFAULT	
	MIN-SUPPLY-T=6	υ	= 1.00 \$ DOE	-2.1 DEFAULT	HEAT-SIZING-RATIO
S-FAN =SYSTEM SCHED FAN-CONTROL=S	-FANS FAN-SCHEDULE=F. PEED	AN-	= 1.00 \$ DOE	-2.1 DEFAULT	COOL-SIZING-RATIO

	RETURN-AIR-PATH		COOL-SH-FT
= DIRECT	HIIMIDIFIER-TYPE	= SDL-C27	COIL-BF
= ELECTRIC		= 0.0370 \$ FRAC. OR MULT.	
7010	SHW-HP-SOURCE		COIL-BF-FFLOW
= ZONE	MAX-HUMIDITY	= SDL-C37	COIL-BF-FT
= 100.00 \$ PERCENT		= SDL-C47	
= 0.00 \$ PERCENT	MIN-HUMIDITY	PLANT1 = PLANT-ASSIGNMENT	SYSTEM-NAMES =
	PREHEAT-T	(SYST-1) \$ REFERENCE FROM THE	IECC1107 FILE
= 45 \$ F		FLECTRIC	DHW-TYPE =
= 0.00	DESC CIRE MODE		DHW-SCH =
	DESC-DEW-SET	DHWSCH-1	DIN CAL MIN -
= 50.00 \$ F	OA-CONTROL	0.03472 \$CALCULATED FROM	ASHRAE 90.1 USER'S
	SUPPLY-DELTA-T =	MANOAL FAGE / 14	
3.37 \$ R		DHWSCH-1 = SCHEDULE THRU FE	B 3 (ALL) (1,24)
0.0011 \$ KW/CFM	SUPPLI-RW/FLOW -	(1) THRU AUG	25 (ALL) (1,24)
	MOTOR-PLACEMENT =	(1)	
IN-AIRFLOW	FAN-PLACEMENT =	(1)	31 (ALL) (1,24)
DRAW-THROUGH	-		
1 10 S FRAC OR MULT	MAX-FAN-RATIO =	PLTSCH2 = SCHEDULE THRU FEB	3 (ALL) (1,24) (1) 25 (ALL) (1,24)
	MIN-FAN-RATIO =	(1)	
0.300 \$ FRAC. OR MULT.		(1) THRU DEC	31 (ALL) (1,24)
NOT-AVAILABLE	NIGHI-VENI-CIKL -		
	NIGHT-VENT-DT =	PLOTER3 = REPORT-BLOCK	
5.0 Ş K	RATED-CCAP-FFLOW	VARIABLE-TYPE = GLO VARIABLE-LIST = (8)	\$ DRY BULB
= SDL-C80		TEMPERATURE (°F) FROM SUPLEME	NT PAGE A.16
= SDL-C7	COOL-CAP-FT	PLOTER4 = REPORT-BLOCK VARIABLE-TYPE = PLA	NT1

```
VARIABLE-LIST = (1, 2, 3) .. $ TOTAL PLANT-COSTS PROJECT-LIFE=25 DISCOUNT-
COOLING LOAD (Btu/hr), TOTAL HEATING LOAD
                                                RATE=5 ..
(Btu/hr), TOTAL ELECTRICAL LOAD (Kw) FROM
                                               ENERGY-RESOURCE RESOURCE=ELECTRICITY ..
SUPLEMENT PAGE A.48
                                                 ENERGY-RESOURCE RESOURCE=NATURAL-GAS
                                                ENERGY/UNIT=100000
LDS-REP-2 = HOURLY-REPORT
                                                                UNIT-NAME=THERMS ..
          REPORT-SCHEDULE = PLTSCH2
          REPORT-BLOCK = (PLOTER3, PLOTER4)
                                                END ..
          OPTION = PRINT ..
                                                COMPUTE PLANT ..
                                                STOP ..
END ..
COMPUTE SYSTEMS ..
INPUT PLANT
             INPUT-UNITS = ENGLISH
$DOE-2 DEFAULT (OR METRIC)
              OUTPUT-UNITS = ENGLISH ...
$DOE-2 DEFAULT (OR METRIC)
PLANT1 = PLANT-ASSIGNMENT ...
                                                This is the input file for Denver that uses SYSTEM-
                                                TYPE=SUM
            PLANT-REPORT SUMMARY=(PS-A, PS-E,
                                                STYPE OF BUILDING
BEPS) ..
                                                $SAMPLE1E-RUN3A WITH MODIFICATION
                                                STEST CASE ONE SIX ZONE MODEL
              $ EQUIPMENT DESCRIPTION
                                                $FILE NAME = 01A1.INP
              $ HOT-WATER BOILER
SBOIL1 =PLANT-EOUIPMENT TYPE=HW-BOILER
                                                SIZE=-999 .. $ AUTOSIZE
                                                *****
                                                       PROGRAM:
                                                                         DOE-2 SIMULATION
        PLANT-PARAMETERS HERM-REC-COND-
                                                INPUT FILE
TYPE=AIR ..
                                                $
                                                $
                                                      LANGUAGE: DOE-2.1E BDL VERSION
              $ AIR-COOLED RECIPROCATING
                                                110
CHILLER
                                                Ś
                                                $
                                                       SPONSOR:
                                                                         National Science
CHIL1 =PLANT-EQUIPMENT TYPE=HERM-REC-CHLR
                                                Foundation
SIZE=-999 .. $ AUTOSIZE
                                                $
                                                $
                                                                         NSF, 2010.
                                                       COPYRIGHT:
```

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en.D, P.E.	Drofocor	२ ८	MOONSEONC JEONG
э с	Professor Decembra of	<u> </u>	WOONSEONG JEONG
ې ۲ x z b i t z z t u z z	Department of	ት ድ	Ph.D. Student
Architecture			Department of
	Energy Systems	Architecture	
Laboratory			Texas A&M
	Texas A&M	University, College Station,	
University, College Station, TX		ቅ 2	
Ş	PHONE: (9/9)845-6065		* * * * * * * * * * * * * * * * * * * *
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Ş	Assistant Professor		
Ş	Department of		
Architecture			
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\$	PHONE: (979)845-0584	\$!	
\$!	
\$ STUDENTS :	JOSE LUIS BERMUDEZ	\$!	
ALCOCER		!	
\$	Ph.D. student	\$!	
\$	Department of	!	
Architecture		\$!	
\$	Texas A&M	!	
University, College Station, TX		\$!	
\$!	
\$	SANDEEP KOTA	\$!	
\$	Ph.D. student	!	

\$ 1 ! ABORT ERRORS .. \$ DIAGNOSTIC DEFAULTS .. ! \$ ADDED ! COMMAND TO PRINT ALL THE DEFAULTS \$ SPACE1-1 1 ! LOADS-REPORT \$ I. SUMMARY = (ALL-SUMMARY) \$ ADDED ļ COMMAND TO PRINT ALL THE LOADS SUMMARY REPORTS \$ 1 VERIFICATION = (ALL-VERIFICATION) \$ ADDED COMMAND TO PRINT ALL THE LOADS VERIFICATION ! \$! REPORTS ! REPORT-FREQUENCY = HOURLY \$ DEFAULTS \$! FOR LOADS-REPORT ! = NO-SAVE .. \$ DEFAULTS HOURLY-DATA-SAVE \$ 1 FOR LOADS-REPORT \$! ! \$ 1 \$ 1 I Ś \$ DENVER DESIGN DAYS. DRY-BULB AND DEW POINT TEMPERATURES FROM 1993 ASHRAE HANDBOOK (CHAPTER 24) INPUT LOADS INPUT-UNITS = ENGLISH \$DOE-2 DEFAULT (OR METRIC) WINTER1=DESIGN-DAY \$ ALL VALUES OUTPUT-UNITS = ENGLISH .. \$DOE-2 ARBITRARY DEFAULT (OR METRIC) DRYBULB-HI= 1 \$ (DEG F) DRYBULB-LO= 1 \$ (DEG F) TITLE HOUR-HI= 13 \$ (HOURS) LINE-1 *NSF PROJECT * HOUR-LO= 1 \$ (HOURS) LINE-2 *TEST CASE-1 * DEWPT-HI= 32 \$ (DEG F) LINE-3 *ONE-ZONE MODEL* .. DEWPT-LO= 32 \$ (DEG F) DHOUR-HI= 15 \$ (HOURS) RUN-PERIOD FEB 3 2010 THRU FEB 3 2010 DHOUR-LO=3 \$ (HOURS) AUG 25 2010 THRU AUG 25 2010 \$ (KNOTS) WIND-SPEED= 7 JAN 1 2010 THRU DEC 31 2010 \$ WIND-DIR= 8 0=NORTH, 1=NNE

\$ DENVER WEATHER FILE.

BUILDING-LOCATION \$ BUILDING LOCATION INPUT COMMAND = 39.83 LATTTUDE \$ LATITUDE FOR CITY OF DENVER = 104.65 LONGITUDE \$ LONGITUDE FOR CITY OF DENVER ALTITUDE = 5413.00 \$ ALTITUDE FOR CITY OF DENVER = YES HOLIDAY \$ DOE-2.1E DEFAULT FOR HOLIDAYS = YES (USA-NATIONAL HOLIDAYES) TIME-ZONE = 7 \$ TIME ZONE FOR THE CITY OF DENVER AZIMUTH = 0 \$ BUILDING AZIMUTH / SAMP1E RUN 3A AZIMUTH = 30/ TESTCASE= 0 DAYLIGHT-SAVINGS \$ OPTIONS FOR = YES DAYLIGHT SAVINGS DOE-2.1E DEFAULTS=YES = 5000 \$ GROSS FLOOR GROSS-AREA AREA OF THE CONDITIONED SPACE OF THE BUILDING = (1, 24) \$ DOE-2.1E HEAT-PEAK-PERIOD DEFAULT UNUSED = (1,24) \$ DOE-2.1E COOL-PEAK-PERIOD DEFAULT UNUSED ATM-MOISTURE =) \$ UNUSED DOE-21.E DEFAULTS CALCULATED HOURLY FROM DEWPOINT TEMP BY ATM-TURBIDITY = (0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.12, 0.112,0.12,0.12)

U=SUMMER, Z=FALL/SPRING, I=WINTER	
CLEARNESS= 0.6	\$ VARIES FRO
0.5 TO 1.2	
GROUND-T= 77	\$ (DEG F)
FROM REFERENCE PART II PAGE VIII.	93
CUMMED1-DECICN DAV	
SUMMERI-DESIGN-DAI	S ALL VALUES
ARBIIKARI	
DRYBULB-HI= 91	S(DEG F)
DRYBULB-LO= 91	Ş(DEG F)
HOUR-HI= 13	\$(HOURS)
HOUR-LO= 3	\$(HOURS)
DEWPT-HI= 59	\$(DEG F)
DEWPT-LO= 59	\$(DEG F)
DHOUR-HI= 15	\$(HOURS)
DHOUR-LO= 5	\$(HOURS)
WIND-SPEED= 5	\$(KNOTS)
WIND-DIR= 6	\$
0=NORTH, 1=NNE	
CLOUD-AMOUNT= 0	\$
0=CLEAR,10=OVERCAST	
CLOUD-TYPE= 0	\$
0=SUMMER,2=FALL/SPRING,1=WINTER	
CLEARNESS = 0.6	Ś VARTES FRO
0.5 TO 1.2	, , , , , , , , , , , , , , , , , , , ,
GROIIND-T= 81	Ś(DEG F) FRO
REFERENCE PART II PAGE VIII.93	+ (520 1) 1100
\$ *******	****
BUILDING LOCATION INFORMATION	
* * * * * * * * * * * * * * * * * * * *	*****
* * * * * * * * *	

CLOUD-AMOUNT= 0

CLOUD-TYPE= 1

0=CLEAR, 10=OVERCAST

\$

\$
\$ UNUSED DOE-21.E DEFAULTS USED IF WEATHER FILE DO NOT HAVE SOLAR DATA X-REF = 0.0000 \$ UNUSED DOE-21.E DEFAULTS CORDINATES TO TRANSLATE BUILDING LOCATION Y-REF = 0.0000 \$ UNUSED DOE-21.E DEFAULTS CORDINATES TO TRANSLATE BUILDING LOCATION SHIELDING-COEF = 0.2400 \$ DOE-2 DEFAULT, THIS COEFFICIENT USED IN SHERMAN GRIMSRUD INFILTRATION METHOD TERRAIN-PAR1 = 0.8500 \$ DOE-2 DEFAULT IS A CONSTANT. USED TO MODIFY THE FREE STREAM WIND SPEED TO ACCOUNT FOR GROUND ROUGHNESS AND HEIGHT ABOVE GROUND LEVEL AT THE BUILDING SITE TERRAIN-PAR2 = 0.2000 \$ DOE-21.E DEFAULTS IS A CONSTANT USED TO MODIFY THE FREE STREAM WIND SPEED TO ACCOUNT FOR GROUND ROUGHNESS AND HEIGHT ABOVE GROUND LEVEL AT THE BUILDING SITE. WS-TERRAIN-PAR1 = 1.0000 \$ DOE-21.E DEFAULTS IS A CONSTANT CORRESPONDING TO TERRAIN-PART1, BUT FOR THE LOCATION OF THE WIND SPEED MEASUREMENT; I.E., THE WEATHER STATION.

WS-TERRAIN-PAR2 = 0.1500 \$ UNUSED DOE-21.E DEFAULTS IS A CONSTANT CORRESPONDING TO TERRAIN-PART2, BUT FOR THE LOCATION OF THE WIND SPEED MEASUREMENT; I.E., THE WEATHER STATION. WS-HEIGHT-LIST = (33.0) \$ DOE-21.E DEFAULTS SOLAR-REFL-CALC = NO-CALC \$ DOE-21.E DEFAULTS SURF-TEMP-CALC = NO ..

B-SH-1 =SCHEDULE THRU JAN 1 (ALL) (1,24)(1) THRU DEC 31 (ALL) (1,24)(1) ... \$ BUILDING SHADES (REFERENCE FROM IECC1107.INP FILE) \$ BD1 = BUILDING-SHADE X = 0 Y = 0 Z = 0\$COORDINATES HEIGHT = 10.0\$(FT) WIDTH = 5.0\$(FT) AZIMUTH = 90\$(DEGREES) \$(0 TRANSMITTANCE = 0.0TO 1), DOE-2 DEFAULT = 0.9 TILT = 90(DEGREES), DEFAULT = 90SHADE-SCHEDULE = B-SH-1 .. \$ SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING BD2 = BUILDING-SHADEX = 0 Y = 45 Z = 0\$COORDINATES HEIGHT = 10.0\$(FT) WIDTH = 5.0\$(FT) AZIMUTH = 90\$(DEGREES) TRANSMITTANCE = 0.0\$(0 TO 1), DOE-2 DEFAULT = 0.9 TTTT = 90(DEGREES), DEFAULT = 90

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AZIMUTH = 90\$(DEGREES) \$(0 TRANSMITTANCE = 0.0TO 1), DOE-2 DEFAULT = 0.9 TILT = 90(DEGREES), DEFAULT = 90SHADE-SCHEDULE = B-SH-1 ... \$ SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING BD6 = BUILDING-SHADE X = 40 Y = 45 Z = 0\$COORDINATES HEIGHT = 10.0\$(FT) WIDTH = 5.0\$(FT) AZIMUTH = 90\$(DEGREES) \$(0 TRANSMITTANCE = 0.0TO 1), DOE-2 DEFAULT = 0.9 TILT = 90(DEGREES), DEFAULT = 90SHADE-SCHEDULE = B-SH-1 ... \$ SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING BD7 = BUILDING-SHADE X = 60 Y = 0 Z = 0\$COORDINATES HEIGHT = 10.0\$(FT) WIDTH = 5.0\$(FT) AZIMUTH = 90\$(DEGREES) \$(0 TRANSMITTANCE = 0.0TO 1), DOE-2 DEFAULT = 0.9 TILT = 90(DEGREES), DEFAULT = 90SHADE-SCHEDULE = B-SH-1 ... \$ SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING

August 2012

TRANSMITTANCE = 0.0\$(0 TO 1), DOE-2 DEFAULT = 0.9 TILT = 90(DEGREES), DEFAULT = 90SHADE-SCHEDULE = B-SH-1 .. \$ SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING BD11 = BUILDING-SHADE X = 100 Y = 0 Z = 0\$COORDINATES HEIGHT = 10.0\$(FT) WIDTH = 5.0\$(FT) AZIMUTH = 90\$(DEGREES) \$(0 TRANSMITTANCE = 0.0TO 1), DOE-2 DEFAULT = 0.9 TILT = 90(DEGREES), DEFAULT = 90SHADE-SCHEDULE = B-SH-1 .. \$ SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING BD12 = BUILDING-SHADE X = 100 Y = 45 Z = 0\$COORDINATES HEIGHT = 10.0\$(FT) \$(FT) WIDTH = 5.0AZIMUTH = 90\$(DEGREES) \$(0 TRANSMITTANCE = 0.0TO 1), DOE-2 DEFAULT = 0.9 TILT = 90(DEGREES), DEFAULT = 90SHADE-SCHEDULE = B-SH-1 .. \$ SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING

BD13 = BUILDING-SHADE

X = 0 Y = 0 Z = 18.5	
\$COORDINATES	
HEIGHT = 24	\$(FT)
WIDTH = 4	\$(FT)
AZIMUTH = 180	
\$(DEGREES)	
TRANSMITTANCE = 0.0	\$(0
TO 1), $DOE-2$ DEFAULT = 0.9	
TILT = 17.74	
(DEGREES), DEFAULT = 90	
SHADE-SCHEDULE = B-SH-1	\$
SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE	
COMMANDS ARE USED FOR DAYLIGHTING	
BD14 = BUILDING-SHADE	
X = 8 Y = 0 Z = 18.5	
\$COORDINATES	
HEIGHT = 24	\$ (FT)
WIDTH = 4	Ş(E'T)
AZIMUTH = 180	
Ş (DEGREES)	Ċ (0
TRANSMITTANCE = 0.0	Ş(U
TO I), $DOE-2$ DEFAULT = 0.9	
$T_{1LT} = 1/./4$	
\Rightarrow (DEGREES), DEFAULT = 90	ċ
SHADE SCHEDULE = $B-SH-1$.	Ş
SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE	
COMMANDS ARE USED FOR DAYLIGHTING	
RD15 - RUIIDINC-SUADE	
V = 12 V = 0.7 = 18.5	
ŚCOORDINATES	
HEIGHT = 24	
\$ (FT)	
WTDTH = 4	\$ (ፑͲ)
AZIMUTH = 180	Υ(ΙΙ)
\$ (DEGREES)	
TRANSMITTANCE = 0 0	\$(0
TO 1), $DOE-2$ DEFAULT = 0.9	1 10
- , ,	

TILT = 17.74(DEGREES), DEFAULT = 90SHADE-SCHEDULE = B-SH-1 .. \$ SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING BD16 = BUILDING-SHADEX = 16 Y = 0 Z = 18.5\$COORDINATES HEIGHT = 24\$(FT) WIDTH = 4\$(FT) AZIMUTH = 180\$(DEGREES) TRANSMITTANCE = 0.0\$(0 TO 1), DOE-2 DEFAULT = 0.9 TILT = 17.74(DEGREES), DEFAULT = 90SHADE-SCHEDULE = B-SH-1 .. \$ SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING BD17 = BUILDING-SHADE X = 20 Y = 0 Z = 18.5\$COORDINATES HEIGHT = 24\$(FT) WIDTH = 4\$(FT) AZIMUTH = 180\$(DEGREES) \$(0 TRANSMITTANCE = 0.0TO 1), DOE-2 DEFAULT = 0.9 TILT = 17.74(DEGREES), DEFAULT = 90SHADE-SCHEDULE = B-SH-1 ... \$ SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING

BD18 = BUILDING-SHADE

X = 24 Y = 0 Z = 18.5\$COORDINATES HEIGHT = 24\$(FT) WIDTH = 4\$(FT) AZIMUTH = 180\$(DEGREES) TRANSMITTANCE = 0.0\$(0 TO 1), DOE-2 DEFAULT = 0.9 TILT = 17.74(DEGREES), DEFAULT = 90SHADE-SCHEDULE = B-SH-1 .. Ŝ SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING BD19 = BUILDING-SHADEX = 28 Y = 0 Z = 18.5\$COORDINATES HEIGHT = 24\$(FT) WIDTH = 4\$(FT) AZIMUTH = 180\$(DEGREES) TRANSMITTANCE = 0.0\$(0 TO 1), DOE-2 DEFAULT = 0.9 TILT = 17.74(DEGREES), DEFAULT = 90SHADE-SCHEDULE = B-SH-1 .. \$ SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING BD20 = BUILDING-SHADEX = 32 Y = 0 Z = 18.5\$COORDINATES HEIGHT = 24\$(FT) WIDTH = 4\$(FT) AZIMUTH = 180\$(DEGREES)

TRANSMITTANCE = 0.0\$(0 TO 1), DOE-2 DEFAULT = 0.9 TILT = 17.74(DEGREES), DEFAULT = 90SHADE-SCHEDULE = B-SH-1 .. \$ SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING BD21 = BUILDING-SHADEX = 36 Y = 0 Z = 18.5\$COORDINATES HEIGHT = 24\$(FT) WIDTH = 4\$(FT) AZIMUTH = 180\$(DEGREES) TRANSMITTANCE = 0.0\$(0 TO 1), DOE-2 DEFAULT = 0.9 TILT = 17.74(DEGREES), DEFAULT = 90SHADE-SCHEDULE = B-SH-1 ... \$ SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING BD22 = BUILDING-SHADE X = 40 Y = 0 Z = 18.5\$COORDINATES HEIGHT = 24\$(FT) WIDTH = 4\$(FT) AZIMUTH = 180\$(DEGREES) \$(0 TRANSMITTANCE = 0.0TO 1), DOE-2 DEFAULT = 0.9 TILT = 17.74(DEGREES), DEFAULT = 90Ś SHADE-SCHEDULE = B-SH-1 .. SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING

BD23 = BUILDING-SHADEX = 44 Y = 0 Z = 18.5\$COORDINATES HEIGHT = 24\$(FT) WIDTH = 4\$(FT) AZIMUTH = 180\$(DEGREES) \$(0 TRANSMITTANCE = 0.0TO 1), DOE-2 DEFAULT = 0.9 TILT = 17.74(DEGREES), DEFAULT = 90SHADE-SCHEDULE = B-SH-1 ... SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING BD24 = BUILDING-SHADE X = 48 Y = 0 Z = 18.5\$COORDINATES HEIGHT = 24\$(FT) WIDTH = 4\$(FT) AZIMUTH = 180\$(DEGREES) TRANSMITTANCE = 0.0\$(0 TO 1), DOE-2 DEFAULT = 0.9 TILT = 17.74(DEGREES), DEFAULT = 90SHADE-SCHEDULE = B-SH-1 ... \$ SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING BD25 = BUILDING-SHADE X = 52 Y = 0 Z = 18.5\$COORDINATES HEIGHT = 24\$(FT) WIDTH = 4\$(FT)

AZIMUTH = 180\$ (DEGREES) \$(0 TRANSMITTANCE = 0.0TO 1), DOE-2 DEFAULT = 0.9 TILT = 17.74(DEGREES), DEFAULT = 90SHADE-SCHEDULE = B-SH-1 .. \$ SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING BD26 = BUILDING-SHADEX = 56 Y = 0 Z = 18.5\$COORDINATES HEIGHT = 24\$(FT) WIDTH = 4\$(FT) AZIMUTH = 180\$(DEGREES) TRANSMITTANCE = 0.0\$(0 TO 1), DOE-2 DEFAULT = 0.9 TILT = 17.74(DEGREES), DEFAULT = 90SHADE-SCHEDULE = B-SH-1 .. \$ SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING BD27 = BUILDING-SHADE X = 60 Y = 0 Z = 18.5\$COORDINATES HEIGHT = 24\$(FT) \$(FT) WIDTH = 4AZIMUTH = 180\$(DEGREES) TRANSMITTANCE = 0.0\$(0 TO 1), DOE-2 DEFAULT = 0.9 TILT = 17.74(DEGREES), DEFAULT = 90

SHADE-SCHEDULE = B-SH-1 .. \$ SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING BD28 = BUILDING-SHADE X = 64 Y = 0 Z = 18.5\$COORDINATES HEIGHT = 24\$(FT) WIDTH = 4\$(FT) AZIMUTH = 180\$(DEGREES) TRANSMITTANCE = 0.0\$(0 TO 1), DOE-2 DEFAULT = 0.9 TILT = 17.74(DEGREES), DEFAULT = 90SHADE-SCHEDULE = B-SH-1 .. SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING BD29 = BUILDING-SHADEX = 68 Y = 0 Z = 18.5\$COORDINATES HEIGHT = 24\$(FT) WIDTH = 4\$(FT) AZIMUTH = 180\$(DEGREES) \$(0 TRANSMITTANCE = 0.0TO 1), DOE-2 DEFAULT = 0.9 TILT = 17.74(DEGREES), DEFAULT = 90SHADE-SCHEDULE = B-SH-1 .. Ŝ SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING BD30 = BUILDING-SHADE X = 72 Y = 0 Z = 18.5\$COORDINATES

HEIGHT = 24\$(FT) \$(FT) WIDTH = 4AZIMUTH = 180\$(DEGREES) TRANSMITTANCE = 0.0\$(0 TO 1), DOE-2 DEFAULT = 0.9 TILT = 17.74(DEGREES), DEFAULT = 90SHADE-SCHEDULE = B-SH-1 .. \$ SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING BD31 = BUILDING-SHADE X = 76 Y = 0 Z = 18.5\$COORDINATES HEIGHT = 24\$(FT) WIDTH = 4\$(FT) AZIMUTH = 180\$(DEGREES) \$(0 TRANSMITTANCE = 0.0TO 1), DOE-2 DEFAULT = 0.9 TILT = 17.74(DEGREES), DEFAULT = 90SHADE-SCHEDULE = B-SH-1 .. \$ SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING BD32 = BUILDING-SHADE X = 80 Y = 0 Z = 18.5\$COORDINATES HEIGHT = 24\$(FT) WIDTH = 4\$(FT) AZIMUTH = 180\$(DEGREES) \$(0 TRANSMITTANCE = 0.0TO 1), DOE-2 DEFAULT = 0.9

TILT = 17.74(DEGREES), DEFAULT = 90SHADE-SCHEDULE = B-SH-1 .. SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING BD33 = BUILDING-SHADE X = 84 Y = 0 Z = 18.5\$COORDINATES HEIGHT = 24\$(FT) WIDTH = 4\$(FT) AZIMUTH = 180\$(DEGREES) TRANSMITTANCE = 0.0\$(0 TO 1), DOE-2 DEFAULT = 0.9 TILT = 17.74(DEGREES), DEFAULT = 90SHADE-SCHEDULE = B-SH-1 .. \$ SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING BD34 = BUILDING-SHADEX = 88 Y = 0 Z = 18.5\$COORDINATES HEIGHT = 24\$(FT) WIDTH = 4\$(FT) AZIMUTH = 180\$(DEGREES) \$(0 TRANSMITTANCE = 0.0TO 1), DOE-2 DEFAULT = 0.9 TILT = 17.74(DEGREES), DEFAULT = 90SHADE-SCHEDULE = B-SH-1 .. \$ SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING BD35 = BUILDING-SHADE

X = 92 Y = 0 Z = 18.5\$COORDINATES HEIGHT = 24\$(FT) WIDTH = 4\$(FT) AZIMUTH = 180\$(DEGREES) \$(0 TRANSMITTANCE = 0.0TO 1), DOE-2 DEFAULT = 0.9 TILT = 17.74(DEGREES), DEFAULT = 90SHADE-SCHEDULE = B-SH-1 .. \$ SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING BD36 = BUILDING-SHADEX = 96 Y = 0 Z = 18.5\$COORDINATES HEIGHT = 24\$(FT) WIDTH = 4\$(FT) AZIMUTH = 180\$(DEGREES) TRANSMITTANCE = 0.0\$(0 TO 1), DOE-2 DEFAULT = 0.9 TILT = 17.74(DEGREES), DEFAULT = 90SHADE-SCHEDULE = B-SH-1 .. \$ SHADE-VIS-REFL = 0.5 DOE-2 DEFAULT, THESE COMMANDS ARE USED FOR DAYLIGHTING ******************************

* BUILDING DESCRIPTION

August 2012

* * * * * * * * * * * * * * * * * * * *	* * * * * * * * * * * *	* * * * * * * * * * * * * * *	SPECIFIC-HEAT	= 0.4	\$(BTU/LB.F)
* * * * * * *					
\$			POLY-EXP	= MATERIAL	\$ DOE2.1E(4
****	* * * * * * * * * * * *	* * * * * * * * * * * * * *	in. FROM REFERENCE 2	ND PART X.B.9	MATERIALS
* * * * * * * * * * * * * * * * * * * *	******	* * * * * * * * * * * * * *	LIBRARY)		
* * * * * * * * * * * * * * * * * * * *	*****	* *	THICKNESS	= 0.4166	\$(FT)
			CONDUCTIVITY	= 0.02	
			\$ (BTU_FT/HR_FT^2_F)		
Ś			DENSITY	= 1 8	\$(LB/FT^3)
~ ******	******	* * * * * * * * * * * * * *	SPECIFIC-HEAT	= 0.29	(BTU/LB,F)
* * * * * * * * * * * * * * * * * * * *	*****	* * * * * * * * * * * * * * *		0.25	(DIO/ LD·I)
* * * * * * * * * * * * * * * * * * * *	*****	* *	BRICK-4"	= MATERIAL	Ś
Ś			DOE2.1E(FROM REFEREN	CE 2ND PART X.	B.2 MATERIALS
' *********	*****	* * * * * * * * * * * * * *	I,TBRARY)		
***** MATERIALS			THICKNESS	= 0.3333	\$(FT)
****	******	****	CONDUCTIVITY	= 0.4167	. ()
* * * * * * * * * * * *			\$ (BTU FT/HR FT^2 F)	0.1201	
Ś			DENSITY	= 120	\$(LB/FT^3)
' *********	******	****	SPECIFIC-HEAT	= 0.2	$(\underline{2}\underline{2})$ $(\underline{1}\underline{2})$ $(\underline{3})$ $(\underline$
* * * * * * * * * * * * * * * * * * * *	******	* * * * * * * * * * * * * * *	STECTIO MENI	0.2	+ (D10, 10,1)
* * * * * * * * * * * * * * * * * * * *	* * * * * * * * * * * *	. *	MIN-WOOL-FIB	= MATERIAL	\$
			DOE2.1E(FROM REFEREN	CE 2ND PART X.	B.9 MATERIALS
BUILTUP-ROOFING-MAT	= MATERIAL	\$	LIBRARY)		
DOE2.1E(REFERENCE 2ND	PART X.B.2 M	IATERIALS	THICKNESS	= 0.5108	\$ BATT, R-19
LIBRARY)			CONDUCTIVITY	= 0.0250	·,
THICKNESS	= 0.0313	\$(FT)	\$(BTU.FT/HR.FT^2.F)		
CONDUCTIVITY	= 0.0939	1 ()	DENSITY	= 0.60	\$(LB/FT^3)
S(BTIL FT/HR FT^2 F)	0.0000		SPECIFIC-HEAT	= 0.2	(\underline{D}) (\underline{P}) $($
DENSITY	= 70	\$(LB/FT^3)	STECTIC HEAT	0.2	(DIO/ HD .I)
SPECIFIC-HEAT	= 0.35	$(\underline{\mathbf{D}})$ $(\underline{\mathbf{T}})$ $(\underline{\mathbf{T}})$ $(\underline{\mathbf{T}})$ $(\underline{\mathbf{T}})$ $(\underline{\mathbf{T}})$	GYPSIIM	= ΜΔΨΈΡΙΔΙ.	Ś
	0.00	¢(DIO) 1D.I)	DOE2 1E (HOLLOW GYPSH	M BOARD FROM R	FFERENCE 2ND
DOOF-CDAVEL-MAT	- ΜΛΨΕΡΤΛΙ	Ċ	DOEZ.IE (NOLLOW GIISO	TTRDADV)	BEBRUICE ZND
DOF2 1F (DEFEDENCE 2ND			TARI A.D.O MAIERIALO	-0.0417	\$ (ፑሞ)
I TODADY)	FARI A.D. / P	IATERIALS		- 0.0926	Ϋ(ΓΓ)
LIDRARI)	- 0 0/17	\$ (TTT)		- 0.0920	
IHICKNESS	- 0.0417	\$ (ΕΙ)	S(DIU.FI/NK.FI Z.F)	- 10 0	(A س ص ح ۲)
CONDUCTIVE	- 0 021		CDECTEIC HEAM	- 49.0	
	- 0.034		SLFCILIC-HFVI.	- 0.2	γ(BIU/TR'F)
δ (RIO'EI/HK'EI.5')	- -				
	= 5.5	S(LB/FT^3)			

August 2012

AIR-LAYER-HALF-INCH = MATERIAL \$ DOE2.1E(AIR CONCRETE-HE-WEIGHT = MATERIAL \$ DOE2.1E(4 LAYER, 34 IN. OR LESS FOR VERTICAL WALLS FROM IN., DRIED AGGREGATE, 140 LB. FROM REFERENCE 2ND REFERENCE 2ND PART X.B.11 MATERIALS LIBRARY) PART X.B.3 MATERIALS LIBRARY) RESISTANCE = 0.9 ... THICKNESS = 0.33\$(FT) \$(HR.FT^2.F/BTU) = 0.7576CONDUCTIVITY \$(BTU.FT/HR.FT^2.F) PLASTIC-FILM-SEAL = MATERIAL \$ DENSITY = 140.0\$(LB/FT^3) = 0.2 ... DOE2.1E (BUILDING PAPER TYPE FROM REFERENCE 2ND SPECIFIC-HEAT \$(BTU/LB.F) PART X.B.2 MATERIALS LIBRARY) REPRESENTING TAR-PAPER CONCRETE-BLOCK-8" = MATERIAL \$ RESISTANCE = 0.01 .. DOE2.1E (CONCRETE FILLED FROM REFERENCE 2ND PART \$(HR.FT^2.F/BTU) X.B.6 MATERIALS LIBRARY) THICKNESS = 0.6667 \$(FT) = 0.4359= MATERIAL \$ DOE2.1E(FROM CONDUCTIVITY PLYWOOD-HALF-INCH REFERENCE 2ND PART X.B.7 MATERIALS LIBRARY) \$(BTU.FT/HR.FT^2.F) = 0.0417\$(FT) = 115.0\$(LB/FT^3) THICKNESS DENSITY CONDUCTIVITY = 0.0667 SPECIFIC-HEAT = 0.2 .. \$(BTU/LB.F) \$(BTU.FT/HR.FT^2.F) DENSITY = 34.0 \$(LB/FT^3) CONCRETE-LI-WEIGHT = MATERIAL \$ DOE2.1E(4 IN., 80 LB. FROM REFERENCE 2ND PART X.B.5 SPECIFIC-HEAT $= 0.29 \dots$ \$ (BTU/LB.F) MATERIALS LIBRARY) = MATERIAL \$ DOE2.1E(3/4 = 0.33 \$(FT) SOFT-WOOD THICKNESS IN. FROM REFERENCE 2ND PART X.B.8 MATERIALS = 0.2083CONDUCTIVITY LIBRARY) \$(BTU.FT/HR.FT^2.F) THICKNESS = 0.0625 \$(FT) = 80.0 \$(LB/FT^3) DENSITY = 0.2 .. CONDUCTIVITY = 0.0667 SPECIFIC-HEAT \$(BTU/LB.F) \$(BTU.FT/HR.FT^2.F) DENSITY = 34 \$(LB/FT^3) POLY-EXP-2 = MATERIAL \$ DOE2.1E(4 = 0.33 ... \$(BTU/LB.F) in. FROM REFERENCE 2ND PART X.B.9 MATERIALS SPECIFIC-HEAT LIBRARY) = 0.3333SOIL-12IN = MATERIAL \$ SOIL LAYER THICKNESS \$(FT) (FROM BUILDING ENERGY SIMULATION VOL. 23, No.6, = 0.02CONDUCTIVITY PAGES 21-22 WINKELMANN MEMO) \$(BTU.FT/HR.FT^2.F) THICKNESS = 1.0 \$(FT) DENSITY = 1.8 \$(LB/FT^3) = 1.0 $= 0.29 \dots$ \$ (BTU/LB.F) CONDUCTIVITY SPECIFIC-HEAT \$(BTU.FT/HR.FT^2.F) \$(LB/FT^3) DENSITY = 115 MINERAL-WOOL1 = MATERIAL = 0.1 .. SPECIFIC-HEAT \$(BTU/LB.F) \$DOE2.1E (MATERIALS LIBRARY, REFERENCED FROM IECC1107 FILE)

THICKNESS = 0.2917\$(FT) INSIDE-FILM-RES = 0.6800= 0.027/BTU (REFERENCE FROM IECC1107) CONDUCTIVITY \$(BTU.FT/HR.FT^2.F) MATERIAL = (POLY-EXP-2, CONCRETE-LI-DENSITY = 0.6 \$(LB/FT^3) WEIGHT).. \$ MATERIALS FROM OUTSIDE TO INSIDE SPECIFIC-HEAT = 0.2 .. \$(BTU/LB.F) R00-1 = LAYERS SOFT-WOOD1 = MATERIAL THE ROOF CONSTRUCTION \$DOE2.1E(MATERIALS LIBRARY, REFERENCED FROM INSIDE-FILM-RES = 0.76/BTU (REFERENCE FROM IECC1107) IECC1107 FILE) = 0.2083THICKNESS \$(FT) = (ROOF-GRAVEL-MAT, BUILTUP-MATERIAL CONDUCTIVITY = 0.0667ROOFING-MAT, POLY-EXP, SOFT-WOOD) ... \$(BTU.FT/HR.FT^2.F) \$ MATERIALS FROM OUTSIDE TO INSIDE DENSITY = 32 \$(LB/FT^3) = 0.33 .. \$(BTU/LB.F) SPECIFIC-HEAT DOOR-LAY1 = LAYERS FROM IECC1107 FILE Ś MATERIAL = (GYPSUM, MINERAL-WOOL1, SOFT-WOOD1, GYPSUM) . . **** \$ Ś ***** **** LAYERS Ś ********** CONSTRUCTIONS **** * * * * * * * * * * Ś WA-1-2 \$ LAYERS FOR = LAYERS THE EXTERIOR WALL CONSTRUCTION INSIDE-FILM-RES = 0.6800***** \$ HR-SOFT-F /BTU (REFERENCE FROM IECC1107) MATERIAL = (AIR-LAYER-HALF-INCH, BRICK-WALL-1 = CONSTRUCTION 4", PLASTIC-FILM-SEAL, WALL CONSTRUCTION (LAYERED CONSTRUCTION) PLYWOOD-HALF-INCH, MIN-WOOL-FIB, GYPSUM, AIR-LAYER-LAYERS = WA - 1 - 2HALF-INCH).. \$ MATERIALS FROM OUTSIDE TO INSIDE THE EXTERIOR WALL CONSTRUCTION ABSORPTANCE = 0.7000WA - 1 - 3= LAYERSS LAYERS FOR DEFAULT FROM REFERENCE PT1 TTL 47 THE EXTERIOR WALL CONSTRUCTION

\$ HR-SOFT-F

\$ LAYERS FOR

\$ HR-SQFT-F

\$ REFERENCED

\$ EXTERIOR

\$ LAYERS OF

\$ DOE-2.1E

ROUGHNESS = 3.0000 .. \$ DOE-2.1E DEFAULT FROM REFERENCE PT1 III.47

WALL-2 = CONSTRUCTION \$ EXTERIOR WALL CONSTRUCTION (LAYERED CONSTRUCTION) LAYERS = WA - 1 - 3\$ LAYERS OF THE EXTERIOR WALL CONSTRUCTION = 0.7000ABSORPTANCE \$ DOE-2.1E DEFAULT FROM REFERENCE PT1 III.47 ROUGHNESS = 3.0000\$ DOE-2.1E . . DEFAULT FROM REFERENCE PT1 III.47

ROOF-1 = CONSTRUCTION \$ ROOF CONSTRUCTION (LAYERED CONSTRUCTION) = R00 - 1LAYERS \$ LAYERS OF THE ROOF CONSTRUCTION (LAYERED CONSTRUCTION) ABSORPTANCE = 0.7000\$ DOE-2.1E DEFAULT FROM REFERENCE PT1 III.47 ROUGHNESS = 3.0000 .. \$ DOE-2.1E DEFAULT FROM REFERENCE PT1 III.47

DOOR-1 = CONSTRUCTION \$ REFERENCED FROM IECC1107 FILE) LAYERS = DOOR-LAY1 U = 0.2 .. \$ IECC 2001 (RESIDENTIAL BUILDING) (BTU/HR.FT^2.F)

\$ THE SIMULATION TOOL (DOE-2.1E) CAN ACCEPT CUSTOM WINDOWS DESIGNED USING WINDOWS-5 (LBNL) PROGRAM AS A \$ REASON WINDOWS AND DOORS ARE MODELED USING WINDOWS-5 (LBNL) PROGRAM FOR CONSISTANCY .

W-1	=	GLASS-TYPE		
\$ CUSTOM WINDO	W FOR LC	WER SOUTH FRONT	WALL	AND
BACK WINDOWS	WINDOWS-	-5)		
GLASS-TYPE-COL)E =	2001	\$	GLASS
TYPE CODE				
PANES	=	1.0000	\$	FROM
THE WINDOWS-5	LIBRARY			
GLASS-CONDUCTA	ANC =	1.4700	\$	FROM
THE WINDOWS-5	LIBRARY			
VIS-TRANS	=	0.9000	\$	FROM
THE WINDOWS-5	LIBRARY			
INSIDE-EMISS	=	0.8400	\$	FROM
THE WINDOWS-5	LIBRARY			
OUTSIDE-EMISS	=	0.8400	\$	FROM
THE WINDOWS-5	LIBRARY			
SPACER-TYPE-CO)DE =	1.0000	\$	FROM
THE WINDOWS-5	LIBRARY	(ALUMINIUM)		
FRAME-ABS	=	0.7000	\$	FROM
THE WINDOWS-5	LIBRARY			
CONVERGENCE-TO)L =	0.0000	\$	FROM
THE WINDOWS-5	LIBRARY			
W-2	=	GLASS-TYPE		
GLASS-CONDUCTA THE WINDOWS-5 VIS-TRANS THE WINDOWS-5 INSIDE-EMISS THE WINDOWS-5 OUTSIDE-EMISS THE WINDOWS-5 SPACER-TYPE-CO THE WINDOWS-5 FRAME-ABS THE WINDOWS-5 CONVERGENCE-TO THE WINDOWS-5 W-2	NC = LIBRARY = LIBRARY = LIBRARY DE = LIBRARY LIBRARY DL = LIBRARY =	1.4700 0.9000 0.8400 0.8400 1.0000 (ALUMINIUM) 0.7000 0.0000	\$ \$ \$ \$ \$ \$ \$	FROM FROM FROM FROM FROM

\$ CUSTOM WINDOW FOR	R UPPER	SOUTH	FRONT	WALL	
WINDOWS (WINDOWS-5)				
GLASS-TYPE-CODE =	2	2001		\$	GLASS
TYPE CODE					
PANES =	1	1.0000		\$	FROM
THE WINDOWS-5 LIBR.	ARY				

GLASS-CONDUCTANC	c = 1.4700	\$	FROM	OC-2	= DAY-SCHEDULE	(1,24) (0.0)
THE WINDOWS-5 LI	BRARY			••		
VIS-TRANS	= 0.9000) \$	FROM	OC-WEEK	= WEEK-SCHEDULE	(WD) OC-1 (WEH)
THE WINDOWS-5 LI	BRARY			oc-2		
INSIDE-EMISS	= 0.8400) \$	FROM	OCCUPY-1	= SCHEDULE	THRU DEC 31 OC-
THE WINDOWS-5 LI	BRARY			WEEK		
OUTSIDE-EMISS	= 0.8400	\$	FROM			
THE WINDOWS-5 LI	BRARY			\$		
SPACER-TYPE-CODE	E = 1.0000) \$	FROM	* * * * * * * * * * * * *	* * * * * * * * * * * * * * * * * * *	* * * * * * * * * * * * * * * * * *
THE WINDOWS-5 LI	BRARY (ALUMINIU	JM)		* * * * * * * * * * * * *	* * * * * * * * * * * * * * * * * * *	* * * * * * * * * * * * * * * * * *
FRAME-ABS	= 0.7000	\$	FROM	* * * * * * * * * * * * *	* * * * * * * * * * * * * * * * * *	* * * *
THE WINDOWS-5 LI	BRARY			\$		
CONVERGENCE-TOL	= 0.0000) \$	FROM	*****	* * * * * * * * * * * * * * * * * *	* * * * * * * * * * * * * * * * * *
THE WINDOWS-5 LI	BRARY			**** LIGHT	ING SCHEDULE	
				**********	****	* * * * * * * * * * * * * * * * * *
Ś				* * * * * *		
· · · · · · · · · · · · · · · · · · ·	*****	*****	* * * * * *	Ś		
*****	*****	******	* * * * * *	*********	* * * * * * * * * * * * * * * * * * *	* * * * * * * * * * * * * * * * *
* * * * * * * * * * * * * * * * *	*****	* * * *		* * * * * * * * * * * * *	* * * * * * * * * * * * * * * * * *	* * * * * * * * * * * * * * * * *
¢				* * * * * * * * * * * * *	* * * * * * * * * * * * * * * * * *	* * * *
Y ******	*****	****	* * * * * *			
****	TV COUPDITE			T m_1		$(1 \ 9) \ (0 \ 05)$
**************************************	**************************************	*****	* * * * * *		-DAI SCHEDOLL	(1,0) (0.00)
****					TINC SCHEDULE HAS	(3,10) (1.0)
Ċ				QUIFICEZ LIGH	HOUDS	BEEN SEI IO ONE
γ	· • • • • • • • • • • • • • • • • • • •	· • • • • • • • • • • • • • • • • • • •	* * * * * *	DURING OFFICE	HOURS.	(10.24)
· · · · · · · · · · · · · · · · · · ·						(19,24)
			~ ~ ~ ~ ~ ~	(0.05)		
*****	* * * * * * * * * * * * * * * * * * * *	* * * *				
0.0.1		(1 0) (0 0	、 、	T.I5	=DAY-SCHEDULE	(1,24) (0.05)
0C-1	= DAY-SCHEDULE	(1,8) (0.0)	••		
		(9,11) (1.	0)			
		(12,14)		LT-WEEK	=WEEK-SCHEDULE	(MON,FRI) LT-
(0.8,0.4,0.8)				1 (WEH) LT-	2	
		(15,18) (1	.0)			
		(19,21)		LIGHTS-1	=SCHEDULE	THRU DEC 31
(0.5,0.1,0.1)				LT-WEEK		
		(22,24) (0	.0)			
••				\$		
				* * * * * * * * * * * * *	* * * * * * * * * * * * * * * * * *	* * * * * * * * * * * * * * * * * *

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\$																																															
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*	*	*	*	*				G	E	N	Έ	R	А	L		S	Ρ	A	C	E		D	Ē	F	Ί	N	Ι	Т	Ι	0	N	S															
*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
\$																																															
*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	* *	
*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	* *	
*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*													

= SPACE-CONDITIONS

\$

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OFFICE

. .

(1,8) (0.02)

(21, 24) (0.02)

(MON, FRI) EQ-1

THRU DEC 31

(1, 24) (0.2)

(9, 14)

(15, 20)

\$						
* * * * * * *	* * * * * * * * * *	******	*****	* * * * * * * *	*****	* * * * *
* * * * * * *	* * * * * * * * * *	******	******	* * * * * * * *	*****	* * * * *
* * * * * * *	* * * * * * * * * *	******	******	* * * * * *		
\$						
* * * * * * *	* * * * * * * * * *	******	*****	* * * * * * * *	*****	* * * * *
* * * * *	SPECIFIC	SPACE	DETAILS	S		
* * * * * * *	* * * * * * * * * *	******	******	* * * * * * * *	*****	* * * * *

** \$ ****** \$ ***** INFILTRATION SCHEDULE ** Ś

=DAY-SCHEDULE

=DAY-SCHEDULE

=WEEK-SCHEDULE

=SCHEDULE

EQUIPMENT SCHEDULE

(0.4, 0.9, 0.9, 0.9, 0.9, 0.9)

(0.8, 0.7, 0.5, 0.5, 0.3, 0.3)

Ś ***** \$ ***************************** * * ***** Ś * * * * * SPACE1-1

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* * * *

EO-1

. . EO-2

. . EQ-WEEK

EOUIP-1

EQ-WEEK ..

(WEH) EQ-2 ..

* * *

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\$

******	******	* * * * * * * * * * * * * *	SOURCE-TYPE	= ELECTRIC	\$ DOE2
**			DEFAULTS		
\$			SOURCE-POWER	= 0.0000	\$ DOE2
* * * * * * * * * * * * * * * * * * * *	*****	* * * * * * * * * * * * *	DEFAULTS		
* * * * * * * * * * * * * * * * * * * *	*****	* * * * * * * * * * * * * *	EQUIP-LATENT	= 0.0000	\$ DOE2
*****	*****	*	DEFAULTS		
			EQUIP-SENSIBLE	= 1.0000	\$ DOE2
SPACE1-1	= SPACE		DEFAULTS		
ZONE-TYPE	= CONDITIONED	\$ DOE2	SOURCE-LATENT	= 0.5	\$ DOE2
DEFAULTS			DEFAULTS		
AREA	= 5000		SOURCE-SENSIBLE	= 0.4	\$ DOE2
VOLUME	= 70000		DEFAULTS		
Х	= 0.0000		FLOOR-MULTIPLIER	= 1.0000	\$ DOE2
Y	= 0.0000	\$ DOE2	DEFAULTS		
DEFAULTS			LIGHTING-SCHEDULE	= LIGHTS-1	
Z	= 10.0000	\$ DOE2	LIGHTING-TYPE	= REC-FLUOR-F	RV.
DEFAULTS			LIGHT-TO-SPACE	= 0.80	
AZIMUTH	= 0.0000	\$ DOE2	LIGHTING-W/SQFT	= 1.5	
DEFAULTS			DAYLIGHTING	= YES	\$ DAYLIGHING
MULTIPLIER	= 1.0000	\$ DOE2	OPTION IS SWITCHED (ON	
DEFAULTS			LIGHT-REF-POINT1	= (25, 25, 2.7)	\$ LOCATION OF
FLOOR-WEIGHT	= 70	\$ IECC	THE FIRST DAYLIGHT S	SENSOR	
2001,402.1.3.3,DOE2	DEFAULTS IS 70		LIGHT-REF-POINT2	= (75, 25, 2.7)	\$ LOCTION OF
NUMBER-OF-PEOPLE	= 50		THE SECOND DAYLIGHT	SENSOR	
PEOPLE-SCHEDULE	= OCCUPY-1		ZONE-FRACTION1	= 0.5	\$ FRACTION OF
PEOPLE-HEAT-GAIN	= 400	\$ DOE2	THE ZONE CONTROLLED	BY SENSOR 1	
DEFAULTS			ZONE-FRACTION2	= 0.5	\$ FRACTION OF
PEOPLE-HG-LAT	= 130.3	\$ DOE2	THE ZONE CONTROLLED	BY SENSOR 2	
DEFAULTS			LIGHT-SET-POINT1	= 50	\$ TARGET
PEOPLE-HG-SENS	= 252.2	\$ DOE2	ILLUMINATION (FC) RE	EQUIRED AT SENS	SOR 1
DEFAULTS			LIGHT-SET-POINT2	= 50	\$ TARGET
EOUIP-SCHEDULE	= EOUIP-1		ILLUMINATION (FC) RE	EOUIRED AT SENS	SOR 2
EQUIPMENT-W/SQFT	= 1	\$ DOE2	LIGHT-CTRL-TYPE1	= CONTINUOUS	\$ TYPE OF
DEFAULTS			LIGHTING CONTROL FOR	R PORTRION OF Z	CONE AREA
AIR-CHANGES/HR	= 0.25	\$ DOE2	CONTROLLED BY SENSOR	R 1	
DEFAULTS			LIGHT-CTRL-TYPE2	= CONTINUOUS	\$ TYPE OF
TEMPERATURE	= (73)	\$ DOE2	LIGHTING CONTROL FOR	R PORTRION OF Z	CONE AREA
DEFAULTS			CONTROLLED BY SENSOR	R 2	

MIN-POWER-FRAC = 0 \$ LOWEST INPUT POWER FRACTION FOR CONTINUOUSLY DIMMABLE LIGHING CONTROL SYSTEM MIN-LIGHT-FRAC = 0 .. \$ SPECIFIES THE FRACTIONAL LIGHT OUTPUT THAT A CONTINUOUSLY DIMNMABLE \$ LIGHTING

CONTROL SYSTEM PRODUCES AT THE MINIMUM FRACTIONAL INPUT POWER GIVEN BY MIN-POWER-FRAC

FRONT-1	=	EXTERIOR-WALL	
HEIGHT	=	8	
WIDTH	=	100	
Х	=	0	
Y	=	0	
Z	=	0	
AZIMUTH	=	180	
CONSTRUCTION	=	WALL-1	
TILT	=	90.0000 \$ DOE2	
DEFAULTS			
WF-1	=	WINDOW	
WIDTH	=	45	
HEIGHT	=	4.0000	
Х	=	52.5	
Y	=	3.0000	
GLASS-TYPE	=	W-1	
FRONT-2	=	EXTERIOR-WALL	
HEIGHT	=	8	
WIDTH	=	100	
Х	=	0	
Y	=	25	
Z	=	16	
AZIMUTH	=	180	
CONSTRUCTION	=	WALL-1	
TILT	=	90.0000 \$ DOE2	
DEFAULTS			

WF-2 =	WINDOW
WIDTH =	90
HEIGHT =	3.0000
X =	5
Y =	4.0000
GLASS-TYPE =	W-2

PR1 = POLYGON \$ FROM DOCUMENTATION UPDATE PACKAGE #2 PAGE 2.129

(100,0,0) $(100,50,0)$	(100,50,8) (100),25,24)
(100,25,16) (100,0,8)	
RIGHT-1 = EXTERIOR-	WALL POLYGON	I = PRI
Х	= 100	
Y	= 0	
Z	= 0	
CONSTRUCTION	= WALL-1 .	••
DR-1	= DOOR \$(REE	FERENCED FROM
IECC1107 FILE)		
WIDTH	= 3	
HEIGHT	= 7	
Х	= 25	
Y	= 0	
SETBACK = 0.0		\$(FT)
CONSTRUCTION	= DOOR-1	
\$MULTIPLIER	=	UNUSED
\$OVERHANG-A	= 0.0	DOE-2
DEFAULT, UNUSED (FT)		
\$OVERHANG-B	= 0.0	DOE-2
DEFAULT, UNUSED (FT)		
\$OVERHANG-W	= 0.0	DOE-2
DEFAULT, UNUSED (FT)		
\$OVERHANG-D	= 0.0	DOE-2
DEFAULT, UNUSED(FT)		
\$OVERHANG-ANGLE	= 0.0	DOE-2
DEFAULT, UNUSED (DEGR	EES)	

\$LEFT-FIN-A	= 0.0	DOE-2	\$OVERHANG-W	= 0.0	DOE-2
DEFAULT, UNUSED (FT)	0 0		DEFAULT, UNUSED (FT)	0 0	
PERT-FIN-R	= 0.0	DOE-2	SOVERHANG-D	= 0.0	DOE-2
DEFAULT, UNUSED (FT)	0 0		DEFAULT, UNUSED (FT)	0 0	
STEFUL-FIN-H	= 0.0	DOE-2	SOVERHANG-ANGLE	= 0.0	DOE-Z
DEFAULT, UNUSED (FT)	0 0	505 0	DEFAULT, UNUSED (DEGR	EES)	505 0
SLEEET - ETN - D	= 0.0	DOE-2	$S \Box E E' \Box - E' \Box N - A$	= 0.0	DOE-2
DEFAULT, UNUSED (FT)			DEFAULT, UNUSED (FT)		
\$RIGHT-FIN-A	= 0.0	DOE-2	ŞLEFT-FIN-B	= 0.0	DOE-2
DEFAULT, UNUSED (FT)			DEFAULT, UNUSED (FT)		
\$RIGHT-FIN-B	= 0.0	DOE-2	\$LEFT-FIN-H	= 0.0	DOE-2
DEFAULT, UNUSED(FT)			DEFAULT, UNUSED (FT)		
\$RIGHT-FIN-H	= 0.0	DOE-2	\$LEFT-FIN-D	= 0.0	DOE-2
DEFAULT, UNUSED(FT)			DEFAULT, UNUSED(FT)		
\$RIGHT-FIN-D	= 0.0	DOE-2	\$RIGHT-FIN-A	= 0.0	DOE-2
DEFAULT, UNUSED (FT)			DEFAULT, UNUSED(FT)		
\$INF-COEF	= 0.0	USED IF	\$RIGHT-FIN-B	= 0.0	DOE-2
INFILTRATION METHOD=CRACK(0 TO 160)			DEFAULT, UNUSED (FT)		
SKY-FORM-FACTOR	= 0.5	\$ARBITRARY	\$RIGHT-FIN-H	= 0.0	DOE-2
VALUE(0 TO 1)			DEFAULT, UNUSED (FT)		
GND-FORM-FACTOR	= 0.5	\$ARBITRARY	\$RIGHT-FIN-D	= 0.0	DOE-2
VALUE(0 TO 1)			DEFAULT, UNUSED(FT)		
\$SHADING-DIVISIONS	= 10		\$INF-COEF	= 0.0	USED IF
INSIDE-VIS-REFL	= 0.0	\$DOE-2	INFILTRATION METHOD	=CRACK(0 TO	160)
DEFAULT, FOR DAYLIGH	TING CALC(0	ro 1)	SKY-FORM-FACTOR	= 0.5	, \$ARBITRARY
·			VALUE(0 TO 1)		
DR-2	= DOOR \$(R)	EFERENCED FROM	GND-FORM-FACTOR	= 0.5	\$ARBITRARY
TECC1107 FILE)			VALUE (0 TO 1)		
WIDTH	= 3		\$SHADING-DIVISIONS	= 10	
НЕТСНТ	= 7		INSIDE-VIS-REFL	= 0.0	\$DOE-2
X	= 22		DEFAULT FOR DAYLIGH	TING CALC(0 '	TO 1)
Y	= 0			11100 01110(0	10 1)
SETBACK = 0 0	0	\$ (ፑጥ)	BACK-1	= EXTERIOR	-WAT.T.
CONSTRUCTION	= DOOR-1	+ (+ +)	HEIGHT	= 8	
\$MILTTPLIER	=	UNUISED	WT D T H	= 100	
SOVERHANG-A	= 0 0	DOF = 2	Y Y	= 100	
DEFAILT INNIGED (FT)	- 0.0	DOE 2	X V	- 50	
SOVEDUNIC-B	- 0 0	DOE - 2	⊥ 7	- 0	
YUVERRANG D	- 0.0			- 0	
DEFAULT, UNUSED (FT)			AZIMUTH	= 0	

CONSTRUCTION	= WALL-1		\$OVERHANG-A	= 0.0	DOE-2
TILT	= 90.0000	\$DEGREES	DEFAULT, UNUSED (FT)		
			\$OVERHANG-B	= 0.0	DOE-2
WB-1	= WINDOW		DEFAULT, UNUSED(FT)		
WIDTH	= 24		\$OVERHANG-W	= 0.0	DOE-2
HEIGHT	= 4.0000		DEFAULT, UNUSED (FT)		
Х	= 11		\$OVERHANG-D	= 0.0	DOE-2
Y	= 3.0000		DEFAULT, UNUSED(FT)		
GLASS-TYPE	= W-1		\$OVERHANG-ANGLE	= 0.0	DOE-2
			DEFAULT, UNUSED (DEGF	KEES)	
WB-2	= WINDOW		\$LEFT-FIN-A	= 0.0	DOE-2
WIDTH	= 24		DEFAULT, UNUSED(FT)		
HEIGHT	= 4.0000		\$LEFT-FIN-B	= 0.0	DOE-2
Х	= 65		DEFAULT, UNUSED(FT)		
Y	= 3.0000		\$LEFT-FIN-H	= 0.0	DOE-2
GLASS-TYPE	= W-1		DEFAULT, UNUSED(FT)		
			\$LEFT-FIN-D	= 0.0	DOE-2
PL1	= POLYGON \$ FRO	M	DEFAULT, UNUSED(FT)		
DOCUMENTATION UPDATE PACKAGE #2 PAGE 2.129			\$RIGHT-FIN-A	= 0.0	DOE-2
			DEFAULT, UNUSED(FT)		
			\$RIGHT-FIN-B	= 0.0	DOE-2
(0,50,0) (0,0,0) (0,0,	,8)(0,25,16)		DEFAULT, UNUSED(FT)		
(0,25,24)(0,50,8)			\$RIGHT-FIN-H	= 0.0	DOE-2
LEFT-1	= EXTERIOR-WALI	L POLYGON =	DEFAULT, UNUSED(FT)		
PL1			\$RIGHT-FIN-D	= 0.0	DOE-2
Х	= 0		DEFAULT, UNUSED(FT)		
Y	= 50		\$INF-COEF	= 0.0	USED IF
Z	= 0		INFILTRATION METHOD)=CRACK(0 TO)	160)
CONSTRUCTION	= WALL-1		SKY-FORM-FACTOR	= 0.5	\$ARBITRARY
			VALUE(0 TO 1)		
DR-3	= DOOR \$(REFERE	ENCED FROM	GND-FORM-FACTOR	= 0.5	\$ARBITRARY
IECC1107 FILE)			VALUE(0 TO 1)		
WIDTH	= 3		\$SHADING-DIVISIONS	= 10	
HEIGHT	= 7		INSIDE-VIS-REFL	= 0.0	\$DOE-2
Х	= 25		DEFAULT, FOR DAYLIGH	ITING CALC(0	TO 1)
Y	= 0				
SETBACK = 0.0		\$(FT)	DR-4	= DOOR \$(R)	EFERENCED FROM
CONSTRUCTION	= DOOR-1		IECC1107 FILE)		
\$MULTIPLIER	= U	JNUSED	WIDTH	= 3	

HEIGHT	= 7		INSIDE-VIS-REFL	= 0.0 \$DOE-2	
Х	= 22		DEFAULT, FOR DAYLIGHT	ING CALC(0 TO 1)	
Y	= 0		·		
SETBACK = 0.0		\$(FT)	FLOOR-1	= EXTERIOR-WALL	
CONSTRUCTION	= DOOR-1		HEIGHT	= 50	
\$MULTIPLIER	=	UNUSED	WIDTH	= 100	
\$OVERHANG-A	= 0.0	DOE-2	Х	= 0	
DEFAULT, UNUSED(FT)			Y	= 50	
\$OVERHANG-B	= 0.0	DOE-2	Z	= 0	
DEFAULT, UNUSED(FT)			AZIMUTH	= 180	
\$OVERHANG-W	= 0.0	DOE-2	CONSTRUCTION	= WALL-2	
DEFAULT, UNUSED(FT)			TILT	= 180.0000 \$	
\$OVERHANG-D	= 0.0	DOE-2	REFERENCE FROM BUILD	ING ENERGY SIMULATION VOL.	
DEFAULT, UNUSED(FT)			23, No.6, PAGE 21 WINKELMANN MEMO		
\$OVERHANG-ANGLE	= 0.0	DOE-2			
DEFAULT, UNUSED (DEGRE	EES)		TOP-1	= EXTERIOR-WALL	
\$LEFT-FIN-A	= 0.0	DOE-2	HEIGHT	= 30.39	
DEFAULT, UNUSED(FT)			WIDTH	= 104	
\$LEFT-FIN-B	= 0.0	DOE-2	Х	= -2	
DEFAULT, UNUSED(FT)			Y	= -3.95	
\$LEFT-FIN-H	= 0.0	DOE-2	Z	= 6.73	
DEFAULT, UNUSED(FT)			AZIMUTH	= 180	
\$LEFT-FIN-D	= 0.0	DOE-2	CONSTRUCTION	= ROOF-1	
DEFAULT, UNUSED(FT)			TILT	= 17.7400 \$ DOE2	
\$RIGHT-FIN-A	= 0.0	DOE-2	DEFAULTS		
DEFAULT, UNUSED(FT)					
\$RIGHT-FIN-B	= 0.0	DOE-2	TOP-2	= EXTERIOR-WALL	
DEFAULT, UNUSED(FT)			HEIGHT	= 36.35	
\$RIGHT-FIN-H	= 0.0	DOE-2	WIDTH	= 104	
DEFAULT, UNUSED(FT)			Х	= 102	
\$RIGHT-FIN-D	= 0.0	DOE-2	У	= 52.25	
DEFAULT, UNUSED(FT)			Z	= 6.55	
\$INF-COEF	= 0.0	USED IF	AZIMUTH	= 0	
INFILTRATION METHOD=CRACK(0 TO 160)			CONSTRUCTION	= ROOF-1	
SKY-FORM-FACTOR	= 0.5	ŞARBITRARY	TILT	= 32.6200 \$ DOE2	
VALUE(0 TO 1)			DEFAULTS		
GND-FORM-FACTOR	= 0.5	\$ARBITRARY			
VALUE(0 TO 1)			\$HOURLY REPORTS\$		
\$SHADING-DIVISIONS	= 10				

PLTSCH = SCHEDULE THRU FEB 3 (ALL) (1,24) (1)REPORT-FREOUENCY THRU AUG 25 (ALL) (1, 24) = HOURLY (1)HOURLY-DATA-SAVE THRU DEC 31 (ALL) (1,24) = NO-SAVE .. (1) .. \$ SYSTEMS SCHEDULES PLOTER1 = REPORT-BLOCK VARIABLE-TYPE = GLOBAL FAN-1 =DAY-SCHEDULE (1, 24) (1)VARIABLE-LIST = (1, 4, 6) ... \$. . CLEARNESS NUMBER, DRY BULB TEMPERATURE (°F), FAN-2 =DAY-SCHEDULE (1, 24) (1) CLOUD AMOUNT (0 TO 10) FROM REFERENCE PT1 III.101 FAN-SCHED =SCHEDULE THRU DEC 31 (WD) FAN-1 (WEH) FAN-2 .. PLOTER2 = REPORT-BLOCK VARIABLE-TYPE = BUILDING HEAT-1 =DAY-SCHEDULE (1,24) (68) ... VARIABLE-LIST = (1, 2, 19, 20, 37)HEAT-2 =DAY-SCHEDULE (1,24) (68) \$ BUILDING HEATING LOAD (SENSIBLE), BUILDING HEAT-WEEK =WEEK-SCHEDULE (MON, FRI) HEAT-1 HEATING LOAD (LATENT), BUILDING COOLING LOAD (WEH) HEAT-2 .. (SENSIBLE), BUILDING COOLING LOAD (LATENT), HEAT-SCHED =SCHEDULE THRU DEC 31 HEAT-BUILDING ELECTRIC TOTAL FROM REFERENCE PT1 WEEK .. III.103 AND III.104 =SCHEDULE THRU DEC 31 (ALL) COOLOFF (1,24) (1) ... LDS-REP-1 = HOURLY-REPORTTHRU DEC 31 (ALL) HEATOFF =SCHEDULE REPORT-SCHEDULE = PLTSCH (1,24) (1) ... REPORT-BLOCK = (PLOTER1, PLOTER2) OPTION = PRINT .. COOL-1 =DAY-SCHEDULE (1,24) (78) ... COOL-2 =DAY-SCHEDULE (1,24) (78) ... END .. COOL-WEEK =WEEK-SCHEDULE (MON, FRI) COOL-1 COMPUTE LOADS .. (WEH) COOL-2 ... COOL-SCHED =SCHEDULE THRU DEC 31 COOL-INPUT SYSTEMS INPUT-UNITS = ENGLISH WEEK .. \$DOE-2 DEFAULT (OR METRIC) OUTPUT-UNITS = ENGLISH .. R1 =DAY-RESET-SCH SUPPLY-HI=60 \$DOE-2 DEFAULT (OR METRIC) SUPPLY-LO=52 OUTSIDE-LO=30 SYSTEMS-REPORT SUMMARY = (ALL-OUTSIDE-HI=75 ... SAT-RESET =RESET-SCHEDULE THRU DEC 31 (ALL) SUMMARY) R1 ... VERIFICATION = (SV-A)

\$ SYSTEM DESCRIPTION				VE O	ONE-REPORTS =	
ZAIR	=ZONE-AIR	OA-CFM/PER=0		YES		
CONTROL	=ZONE-CONTROL	DESIGN-HEAT-T=70		COOLOFF	=SYSTEM-CONTROL	HEATING-SCHEDULE=
SCHED		HEAT-TEMP-SCH= HE	AT-	HEATOFF		HEAT-SET-T=65
SCHED		COOL-TEMP-SCH= CO	OL-			COOL-CONTROL=RESET COOL-RESET-
TYPE=REV	VERSE-ACTION	THERMOSTAT-		SCH=SAT-RESE	Т	MIN-SUPPLY-T=60
	\$ FOL	LOWING AIR FLOWS A	RE	S-FAN	=SYSTEM-FANS	FAN-SCHEDULE=FAN-
FROM RUN	N 3 SV-A REPORT, \$ DIV	IDED BY ALTITUDE		SCHED FAN-CONTROL=SPEED		SUPPLY-STATIC=2.0
MULTIPLIER				SUPPLY-EFF=.55 NIGHT-CYCLE-		
SPACE1-1 =ZONE SIZING-OPTION=ADJUST-LOADS		ZONE-AIR=ZAIR		CTRL=CYCLE-ON-ANY		
CONTROL		ZONE-CONTROL	=	S-TERM	=SYSTEM-TERMINAL	REHEAT-DELTA-T=58 MIN-CFM-RATIO=0.1
CONDITIC	DNED	ZONE-TYPE	=			
0.00	\$ BTU/HR	BASEBOARD-RATING	=	SYST-1	=SYSTEM	SYSTEM-TYPE=SUM SUPPLY-CFM
0.00	\$ BTU/BTU	PANEL-LOSS-RATIO	=	= 7366		SYSTEM-CONTROL
0.75 \$	FRAC. OR MULT.	EXHAUST-EFF	=	= S-CONT		SYSTEM-FANS
OUTDOOR-	RESET	BASEBOARD-CTRL	=	= S-FAN		SYSTEM-TERMINAL
1.00	\$ R	THROTTLING-RANGE	=	= S-TERM		\$ ECONO-LIMIT-T
0.0003	\$ KW/CFM	ZONE-FAN-KW/FLOW	=	= 65		ZONE-NAMES
SVAV		TERMINAL-TYPE	=	= (SPACE1-1)		HEAT-SOURCE
				= ELECTRIC		

	ZONE-HEAT-SOURCE		FAN-PLACEMENT =
= ELECTRIC	PREHEAT-SOURCE	DRAW-THROUGH	MAX-FAN-RATIO =
= ELECTRIC	BASEBOARD-SOURCE	1.10 \$ FRAC. OR MULT.	MIN-FAN-RATIO =
= ELECTRIC	VARIABLE-T	0.300 \$ FRAC. OR MULT.	NIGHT-VENT-CTRL =
= ON	SIZING-RATIO	NOT-AVAILABLE	NIGHT-VENT-DT =
= 1.00 \$ DOE-2.1 DEFAULT	HEAT-SIZING-RATIO	5.0 \$ R	RATED-CCAP-FFLOW
= 1.00 \$ DOE-2.1 DEFAULT	COOL-SIZING-BATIO	= SDL-C80	
= 1.00 \$ DOE-2.1 DEFAULT	DETIIDN_AID_DATU	= SDL-C7	
= DIRECT	NEIONN-AIN-FAIN	= SDL-C27	COUL-SH-F1
= ELECTRIC	HUMIDIFIER-TYPE	= 0.0370 \$ FRAC. OR MULT.	COIT-RE
= ZONE	SHW-HP-SOURCE	= SDL-C37	COIL-BF-FFLOW
= 100.00 \$ PERCENT	MAX-HUMIDITY	= SDL-C47	COIL-BF-FT
= 0.00 \$ PERCENT	MIN-HUMIDITY	PLANT1 = PLANT-ASSIGNMENT	SYSTEM-NAMES =
= 45 \$ F	PREHEAT-T	(SYST-1) \$ REFERENCE FROM THE	IECC1107 FILE DHW-TYPE =
= 0.00	DESC-CTRL-MODE	ELECTRIC	DHW-SCH =
= 50 00 \$ F	DESC-DEW-SET	DHWSCH-1	DHW-GAL/MIN =
- TEMD	OA-CONTROL	0.03472 \$CALCULATED FROM	ASHRAE 90.1 USER'S
	SUPPLY-DELTA-T =	MANOAL FAGE /-14	
3.37 \$ K	SUPPLY-KW/FLOW =	(1)	B = 3 (ALL) (1,24)
U.UUII Ş KW/CFM	MOTOR-PLACEMENT =	(1) THRU AUG	25 (ALL) (1,24)
IN-AIRFLOW		(1)	31 (ALL) (1,24)

THRU DEC 31 (ALL) (1,24) (1) .. PLOTER3 = REPORT-BLOCKVARIABLE-TYPE = GLOBAL VARIABLE-LIST = (8) .. \$ DRY BULB TEMPERATURE (°F) FROM SUPLEMENT PAGE A.16 PLOTER4 = REPORT-BLOCKVARIABLE-TYPE = PLANT1 VARIABLE-LIST = (1, 2, 3) .. \$ TOTAL COOLING LOAD (Btu/hr), TOTAL HEATING LOAD (Btu/hr), TOTAL ELECTRICAL LOAD (Kw) FROM SUPLEMENT PAGE A.48 LDS-REP-2 = HOURLY-REPORTREPORT-SCHEDULE = PLTSCH2 REPORT-BLOCK = (PLOTER3, PLOTER4) OPTION = PRINT .. END .. COMPUTE SYSTEMS .. INPUT PLANT INPUT-UNITS = ENGLISH \$DOE-2 DEFAULT (OR METRIC) OUTPUT-UNITS = ENGLISH ... \$DOE-2 DEFAULT (OR METRIC) PLANT1 = PLANT-ASSIGNMENT ... PLANT-REPORT SUMMARY=(PS-A, PS-E, BEPS) .. \$ EQUIPMENT DESCRIPTION \$ HOT-WATER BOILER

THRU AUG 25 (ALL) (1,24)

PLTSCH2 = SCHEDULE THRU FEB 3 (ALL) (1,24) (1) SBOIL1 =PLANT-EQUIPMENT TYPE=HW-BOILER SIZE=-999 .. \$ AUTOSIZE

> PLANT-PARAMETERS HERM-REC-COND-TYPE=AIR ..

\$ AIR-COOLED RECIPROCATING CHILLER CHIL1 =PLANT-EOUIPMENT TYPE=HERM-REC-CHLR SIZE=-999 .. \$ AUTOSIZE PLANT-COSTS PROJECT-LIFE=25 DISCOUNT-RATE=5 .. ENERGY-RESOURCE RESOURCE=ELECTRICITY .. ENERGY-RESOURCE RESOURCE=NATURAL-GAS ENERGY/UNIT=100000

UNIT-NAME=THERMS ..

END .. COMPUTE PLANT .. STOP ..

(1)